ECO4CLOUD USER MANUAL

ECO4CLOUD SUITE FOR DATA CENTERS V 2.0

With:

- VMware VSphere 4.x
- VMware VSphere 5.x

This document supports the version of each product listed and supports all subsequent versions until the document is replaced by a new edition. To check for more recent editions of this document, see http://www.eco4cloud.com/support.

The Eco4Cloud Web site also provides the latest product updates. If you have comments about this documentation, submit your feedback to info@eco4cloud.com.

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SUMMARY

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About this book

This document, the Eco4Cloud User Manual, describes how to install and use the Eco4Cloud software components, monitor and manage the information generated by the components, build your Eco4Cloud datacenter environment, consolidate virtual machines within the datacenter environment, and set up rules for virtual machines, hosts and clusters included into the datacenter environment.

INTENDED AUDIENCE

The information presented in this manual is written for system administrators who are experienced Windows or Linux system administrators and who are familiar with VMware virtual machine technology and datacenter operations.

DOCUMENT FEEDBACK

Eco4Cloud welcomes your suggestions for improving our documentation. If you have comments, send your feedback to info@eco4cloud.com.

Installation requirements

Eco4Cloud is composed of two components: a java monitor and virtual machines consolidator, and a web dashboard. Eco4Cloud provides a vApp to simplify the software installation.

The vApp can be imported into a VMware Datacenter or into free, stand-alone systems, like VMware Player or VMware Server or non-free systems, like VMware Workstation.

HARDWARE AND SOFTWARE COMPATIBILITIES

Eco4Cloud Virtual Machine has a VMware version 7 virtual hardware, and has the following requirements.

Minimum System Requirements

- 4 GB of RAM memory;
- 1 processor;
- 20 GB of thin provisioned storage – SATA drive with a 15MBps throughput;
- 1 network card.

Recommended System Requirements

- 8 GB of RAM memory;
- 1 processor;
- 40 GB of thick provisioned, eager zeroed, storage – SSD drive with a 100MBps throughput;
- 1 network card.

Virtual systems supporting vApp are:

- ESX/ESXi 4.x - 5.x
- vCenter 4.x - 5.x
- vCloud Director 1.x
- Server 2.0
- Workstation 6.5.x - 7.x
- VMware Player.

OPERATING SYSTEM AND FEATURES

VApp is a Virtual Machine with an Ubuntu 10.04 Operating System with a single 64-bit processor, 4GB of RAM memory, a network card and a CD-ROM. Of course, virtual hardware can be modified according to new needs even after the installation.

Installation on VMware Systems

INSTALLATION THROUGH OVF IMPORT

Default Virtual Machine format is OVF 1.0, so compatibility is guaranteed with VMware vSphere 4.x and 5.x or VMware vCloud Director 1.0.

If requested, also OVF 0.9 is available, as it can be imported into legacy systems like ESX/ESXi 3.5 and VMware stand-alone products as Workstation 6.5.x or 7.x.

Moreover, ZIP format for free systems as VMware server and player is available, too.

The following procedure shows standard OVF 1.0 format import.

Choose the option "Deploy OVF Template" (Fig. 1), from "File" menu in the vSphere Client connected to vCenter. A wizard will start, including an automatic download of Eco4Cloud virtual application files.

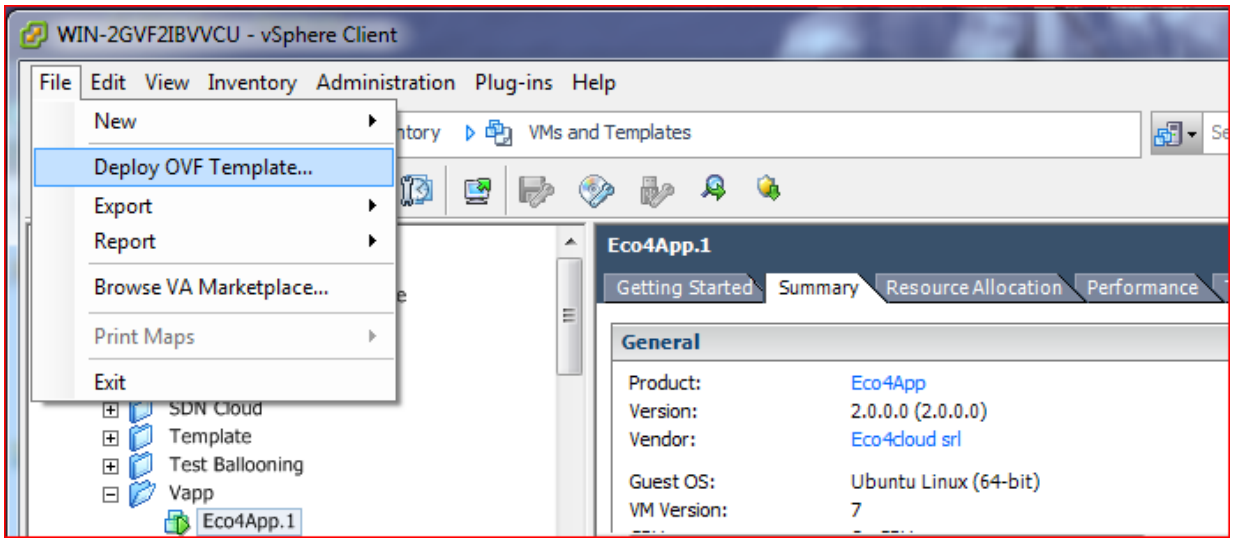


Fig. 1 Deploy OVF Template wizard

In the first wizard window, the .ovf file URL for Internet download will be requested. Alternatively, it is possible to enter a folder from local file system or CD-ROM.

In the following procedure a URL will be used (Fig. 2).

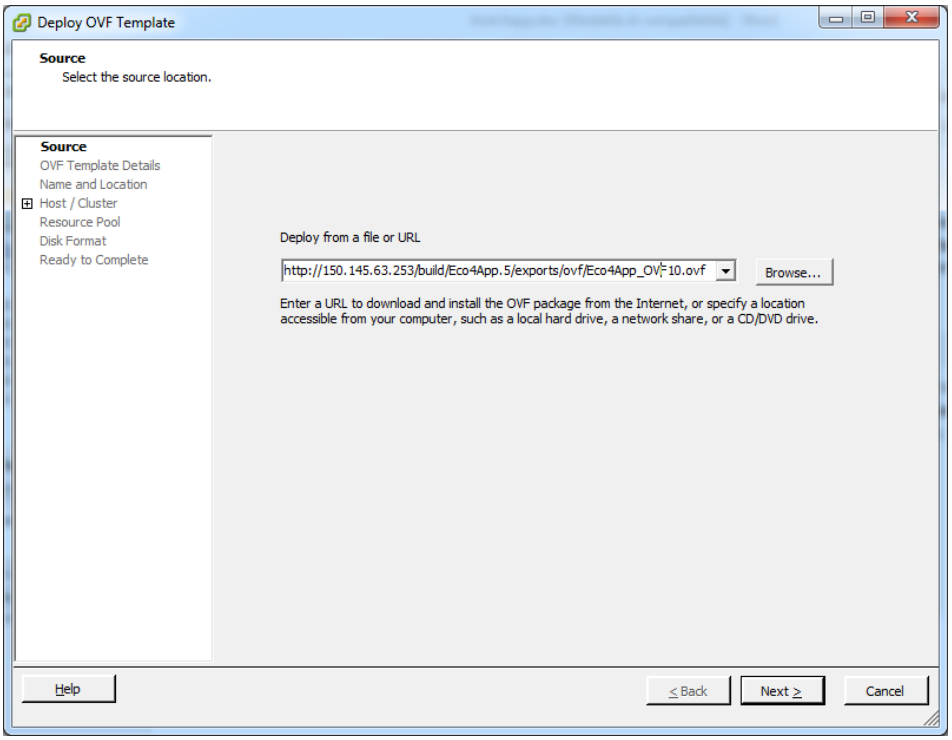

Deploy OVF Template
Source
Select the source location.
Source
OVF Template Details
Name and Location
Host / Cluster
Resource Pool
Disk Format
Ready to Complete
Deploy from a file or URL
http://150.145.63.253/build/Eco4App.5/exports/ovf/Eco4App_OVF10.ovf
Browse...
Enter a URL to download and install the OVF package from the Internet, or specify a location accessible from your computer, such as a local hard drive, a network share, or a CD/DVD drive.
Help
< Back
Next >
Cancel

Fig. 2 Selecting .ovf file source

Clicking on “Next” button, a first virtual machine features recap window will be shown (Fig.3).

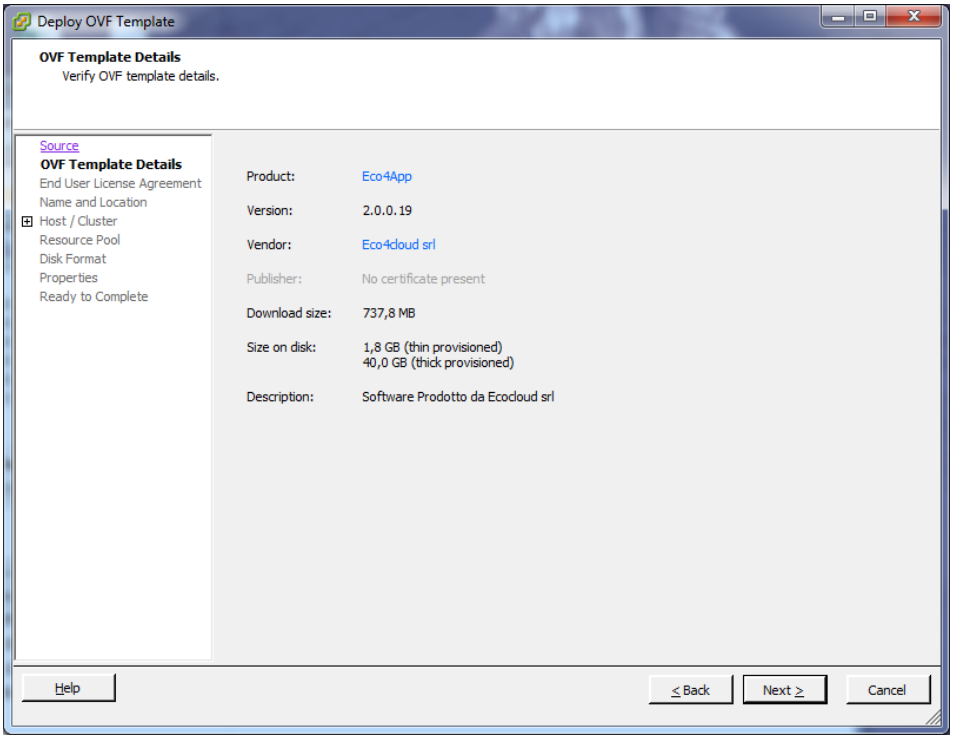


Fig. 3 OVF template details.

In the following window it is possible to accept End User License Agreement by clicking “Accept” and then going ahead clicking on the “Next” button (Fig.4).

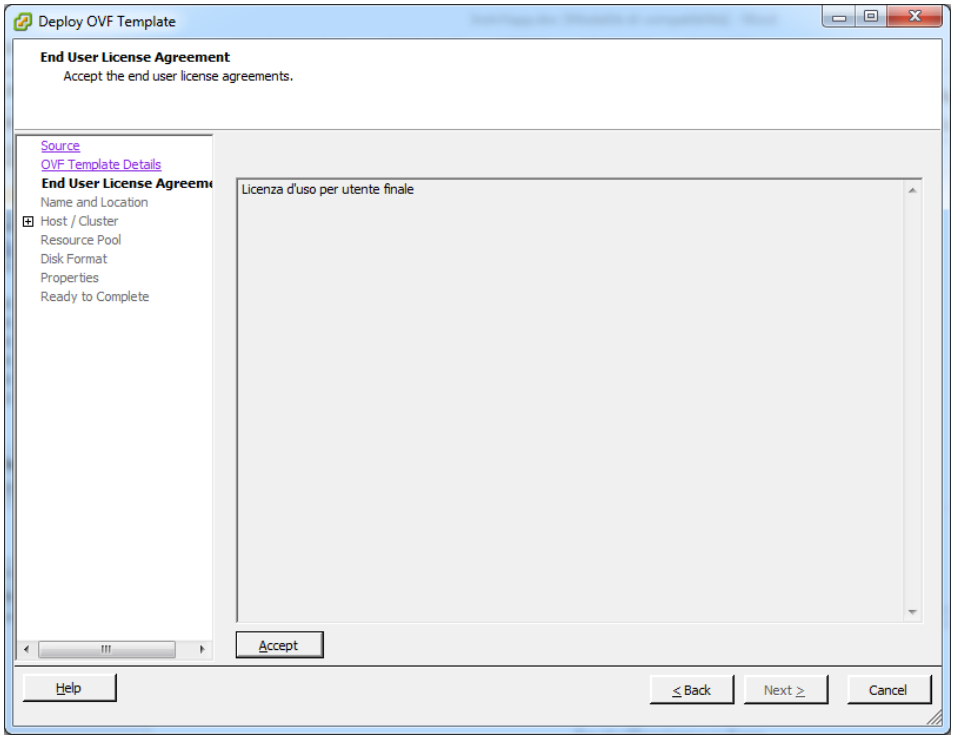


Fig. 4 End User License Agreement.

The next step is the choice of Eco4Cloud virtual machine name and the datecenter wherein it must be deployed (Fig. 5).

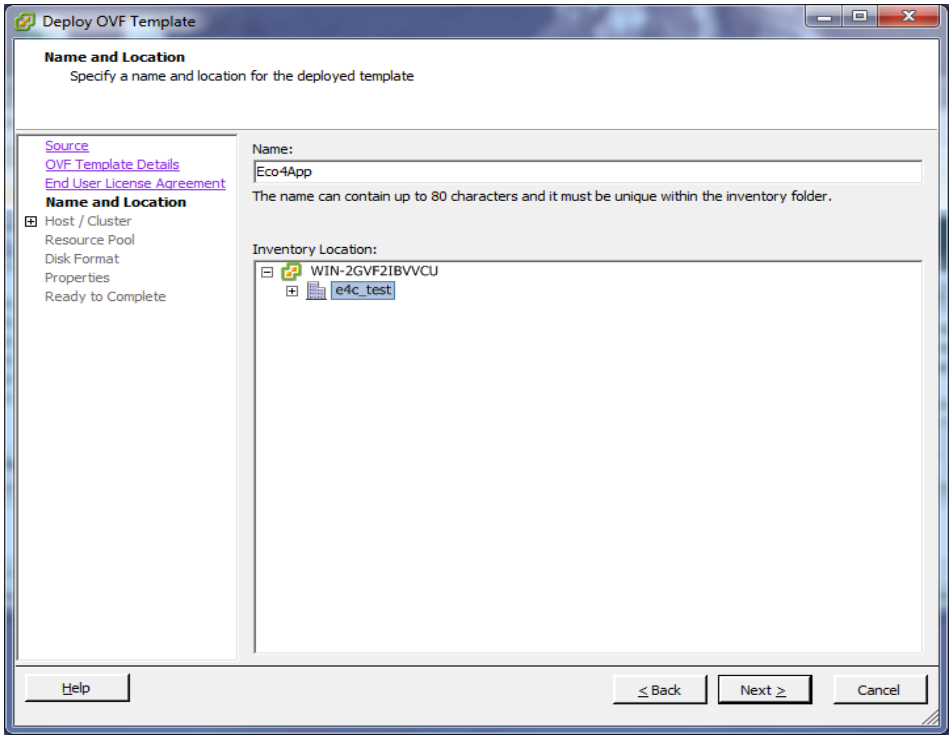


Fig. 5 Virtual machine name and datecenter.

When datacenter is selected, it is possible to choose the cluster where the virtual machine must be deployed (Fig. 6) and the specific host within the chisen cluster (Fig. 7).

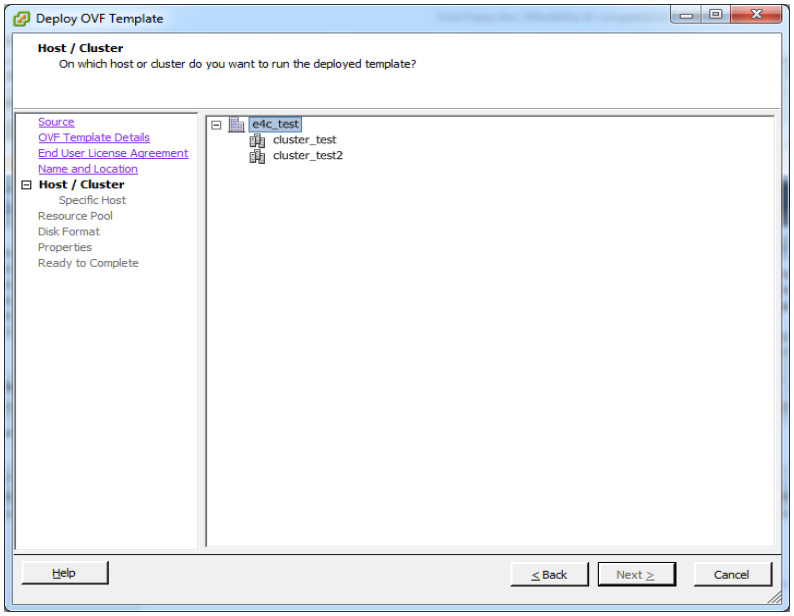


Fig. 6 Cluster choice for the Eco4Cloud VM

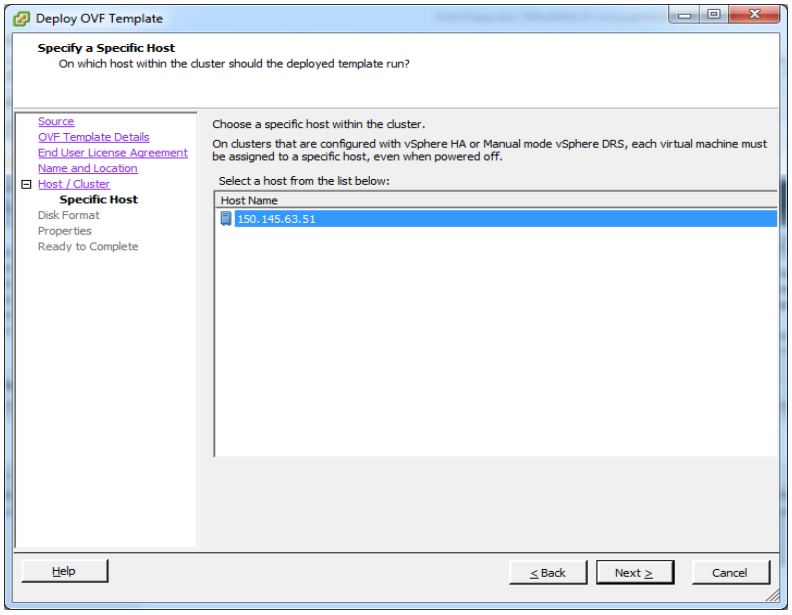

Deploy OVF Template
Specify a Specific Host
On which host within the cluster should the deployed template run?
Source
OVF Template Details
End User License Agreement
Name and Location
Host / Cluster
Specific Host
Disk Format
Properties
Ready to Complete
Choose a specific host within the cluster.
On clusters that are configured with vSphere HA or Manual mode vSphere DRS, each virtual machine must be assigned to a specific host, even when powered off.
Select a host from the list below:
Host Name
150.145.63.51
Help
< Back
Next >
Cancel

Fig. 7 Host choice for the Eco4Cloud VM

Furthermore it is possible to insert the datastore where virtual disks will be stored, and their format (Fig.8 e Fig. 9).

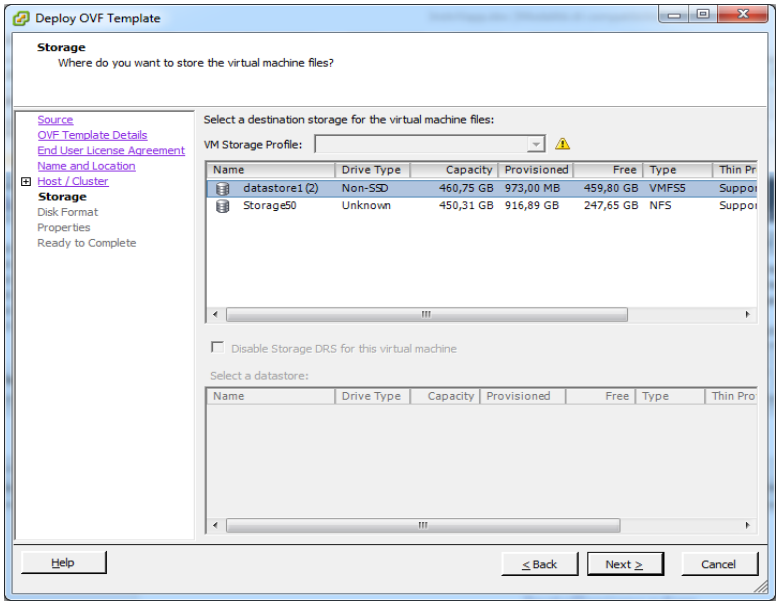


Fig. 8 Storage choice for the Eco4Cloud VM

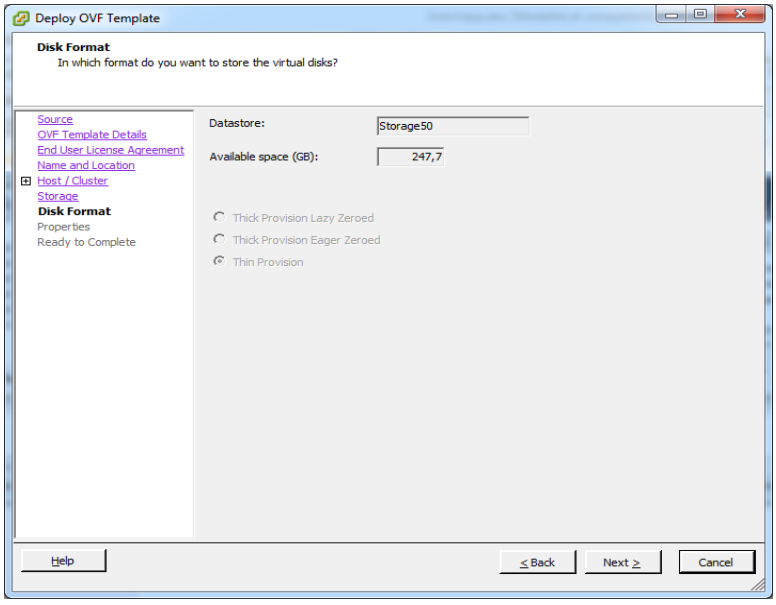


Fig. 9 Storage format for the Eco4Cloud VM

Clicking again on “Next” button, the choice of network parameters is available (Fig. 10). It is noteworthy that, leaving blank fields, DHCP, if previously configured in the network, will take charge of setting network parameters automatically.

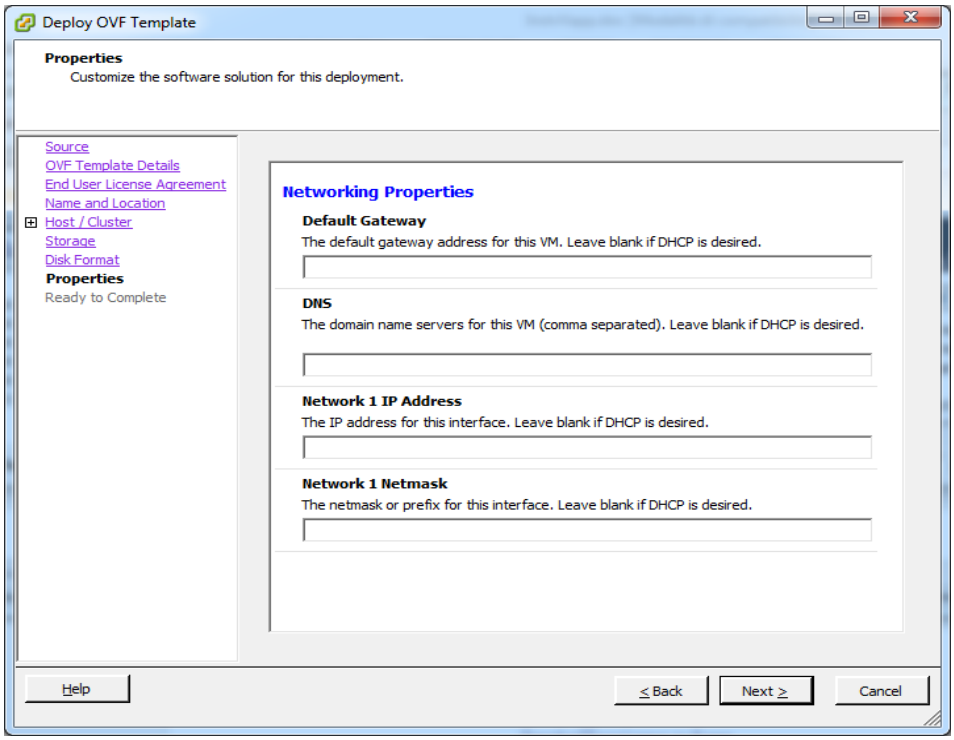

Deploy OVF Template
Properties
Customize the software solution for this deployment.
Source
OVF Template Details
End User License Agreement
Name and Location
Host / Cluster
Storage
Disk Format
Properties
Ready to Complete
Networking Properties
Default Gateway
The default gateway address for this VM. Leave blank if DHCP is desired.
DNS
The domain name servers for this VM (comma separated). Leave blank if DHCP is desired.
Network 1 IP Address
The IP address for this interface. Leave blank if DHCP is desired.
Network 1 Netmask
The netmask or prefix for this interface. Leave blank if DHCP is desired.
Help
< Back
Next >
Cancel

Fig. 10 Network properties

Finally, clicking on the “Finish” button, the import procedure will start (Fig. 11).

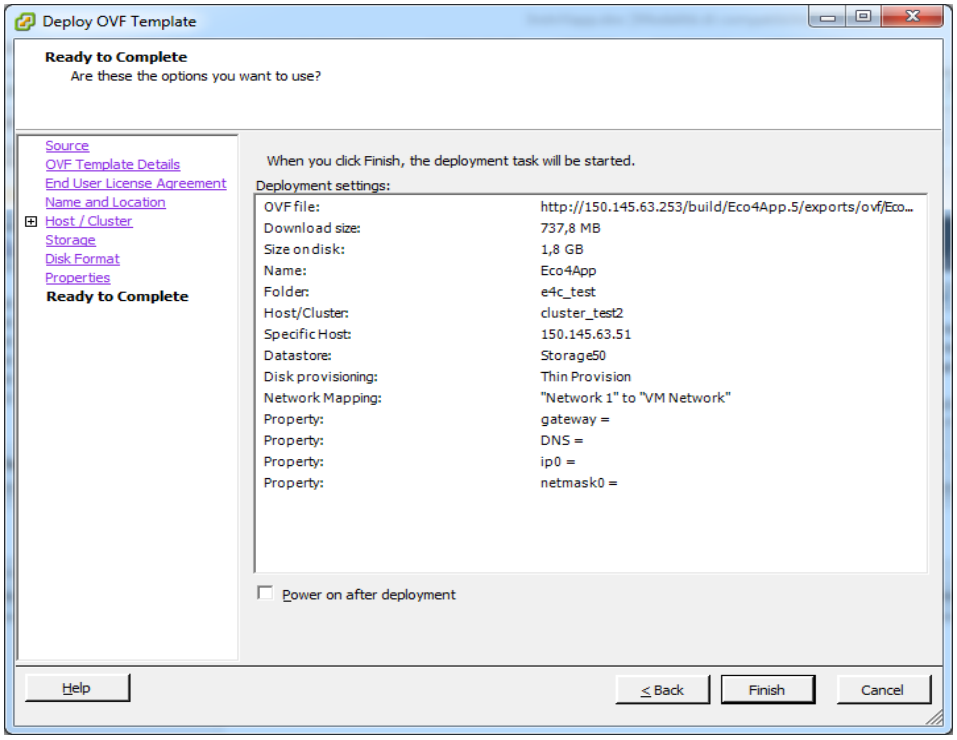


Fig. 11 Final configuration recap.

BEST PRACTICES

Once Eco4Cloud virtual appliance starts working, network communication starts between the appliance and the vCenter. For performances reasons, it is advisable to run Eco4Cloud and vCenter on the same physical machine.

In order to do that, it is possible to set affinity rules between the virtual appliance and the virtual machine where vCenter runs. Depending on vCenter installation, if the vCenter has been installed directly on a physical host, an affinity rule can be set between E4C appliance and the physical host running the vCenter.

If affinity rules are not available, it is also possible to disable consolidation of E4C virtual appliance (and optionally of the vCenter virtual machine itself) via E4C dashboard, as described in section “Virtual machines consolidation constraints”.

VApp Management

VMWARE CONSOLE

After importing Eco4Cloud vApp into vCenter, in needs to be powered on. The first boot can be slower because the virtual machine has to install possible new Operating System updates and configure the environment. Once the boot is completed, the starting window, the console, will appear (Fig. 12).

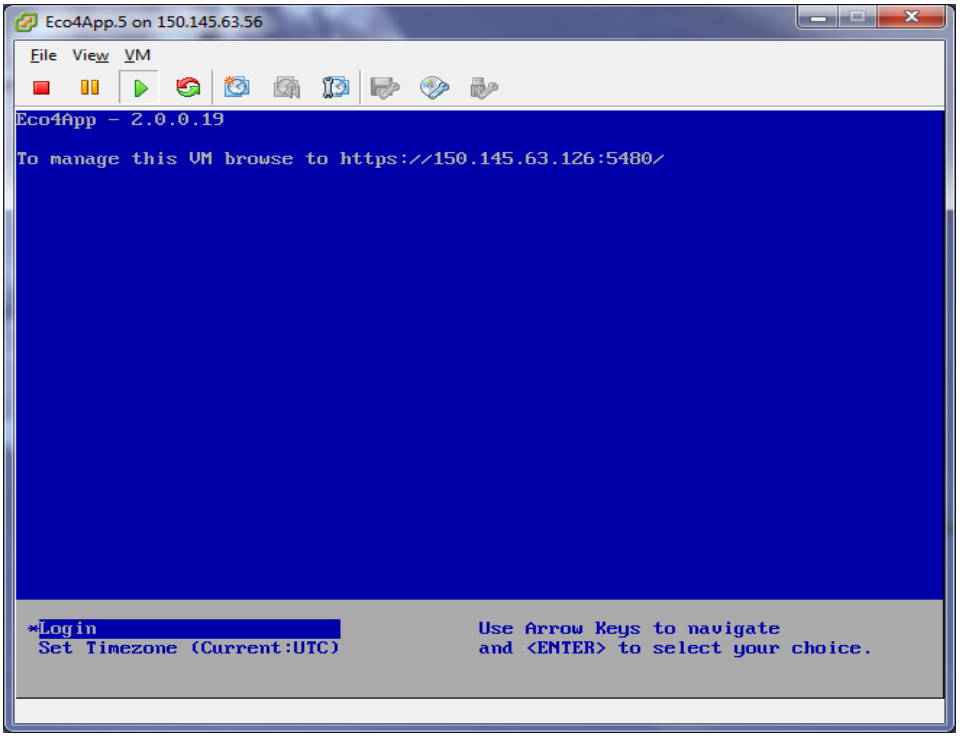


Fig. 12 Vapp Console.

The vApp can be managed via browser, inserting the IP address, as suggested in the screen shown in Figure 12. Alternatively, the console let the user to log in into the Operating System (Ubuntu 10.4.4) or to modify time zone settings. Choosing Set Timezone the screen in Figure 13 will appear. The following screens show how to modify the time zone.

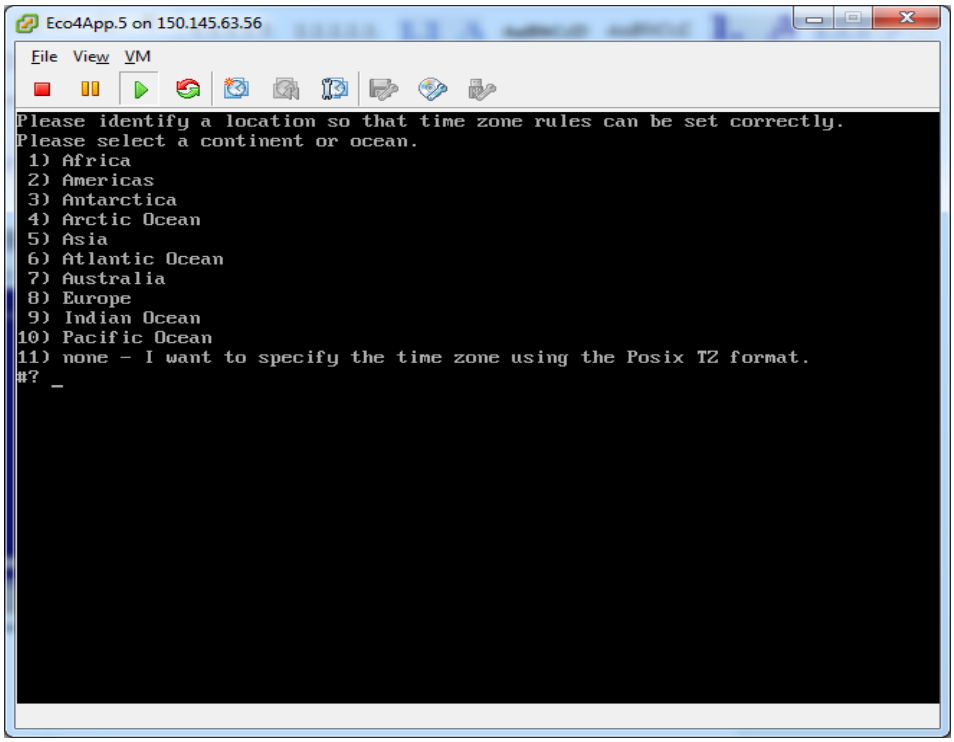

Eco4App.5 on 150.145.63.56
File View VM
Please identify a location so that time zone rules can be set correctly.
Please select a continent or ocean.
1) Africa
2) Americas
3) Antarctica
4) Arctic Ocean
5) Asia
6) Atlantic Ocean
7) Australia
8) Europe
9) Indian Ocean
10) Pacific Ocean
11) none - I want to specify the time zone using the Posix TZ format.
#? _

Fig. 13 Time zone modify.

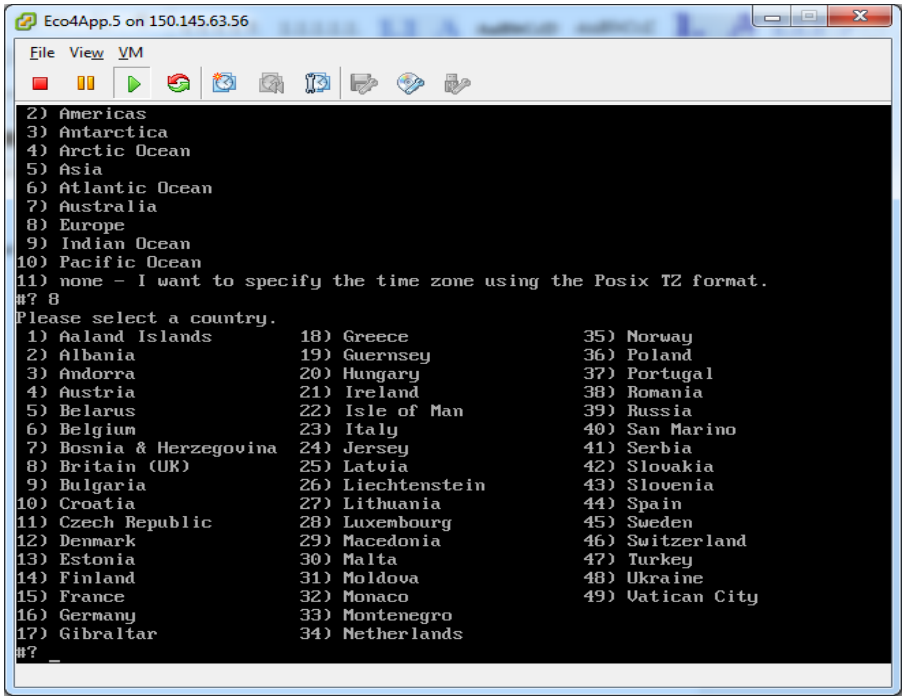


Fig. 14 Time zone modify - 2.

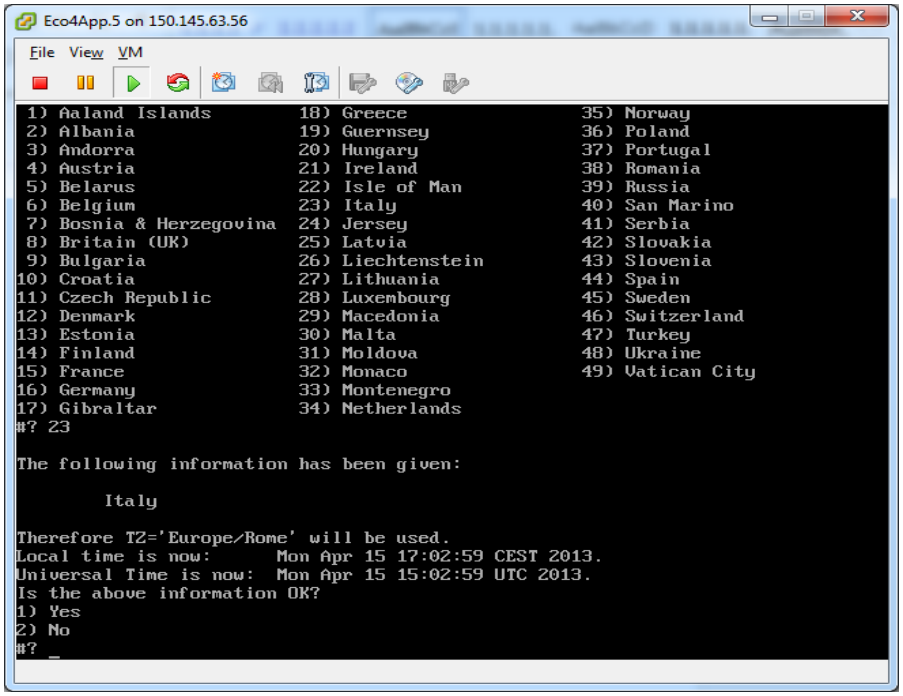


Fig. 15 Location choice.

VAPP MANAGEMENT

WEB APPLICATION

The vApp can be managed via browser, inserting the url https:\\IPaddress:5480, as previously suggested in the screen shown in Figure 12 and using the following credentials:

- User name: **eco4cloud**
- Password: **cloud4eco**

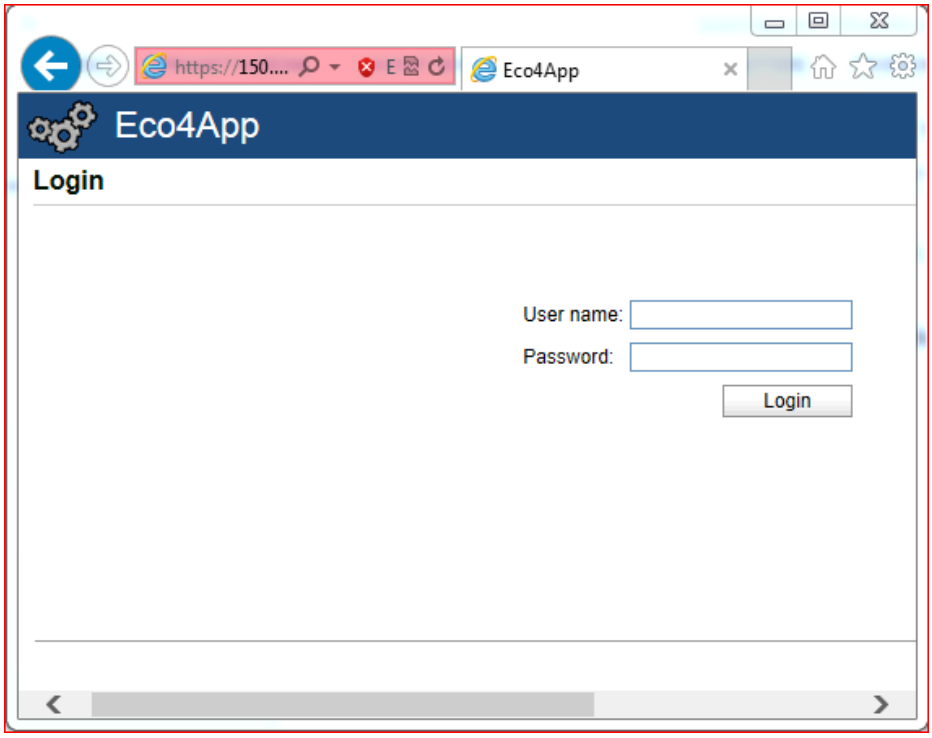


Fig. 16 Initial screen for login.

Once the login is completed, the initial vApp screen appears, with three tabs.

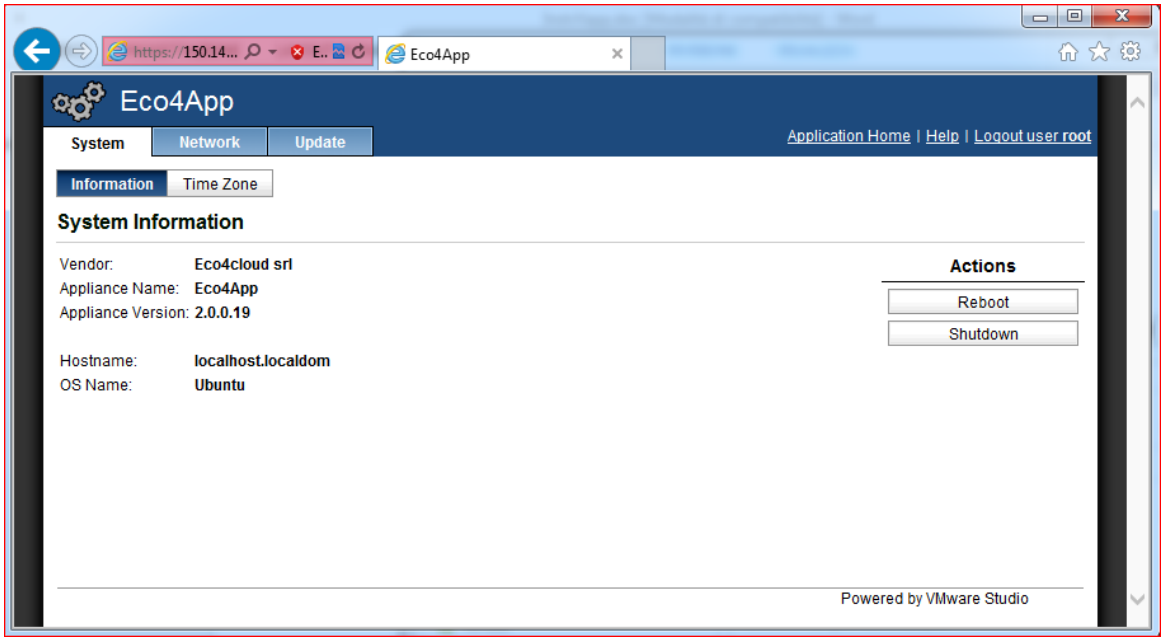


Fig. 17 Initial page for vApp configuration

The first tab (default) is “System”, wherein all main information on software version, virtual machine name and operating system. On the right, one can find “Actions” button, useful to reboot or shutdown the vApp.

Clicking on “Time zone” button, it is possible to modify the assigned time zone. After entering all the desired settings modifications, it is necessary to press button “Save Settings”.

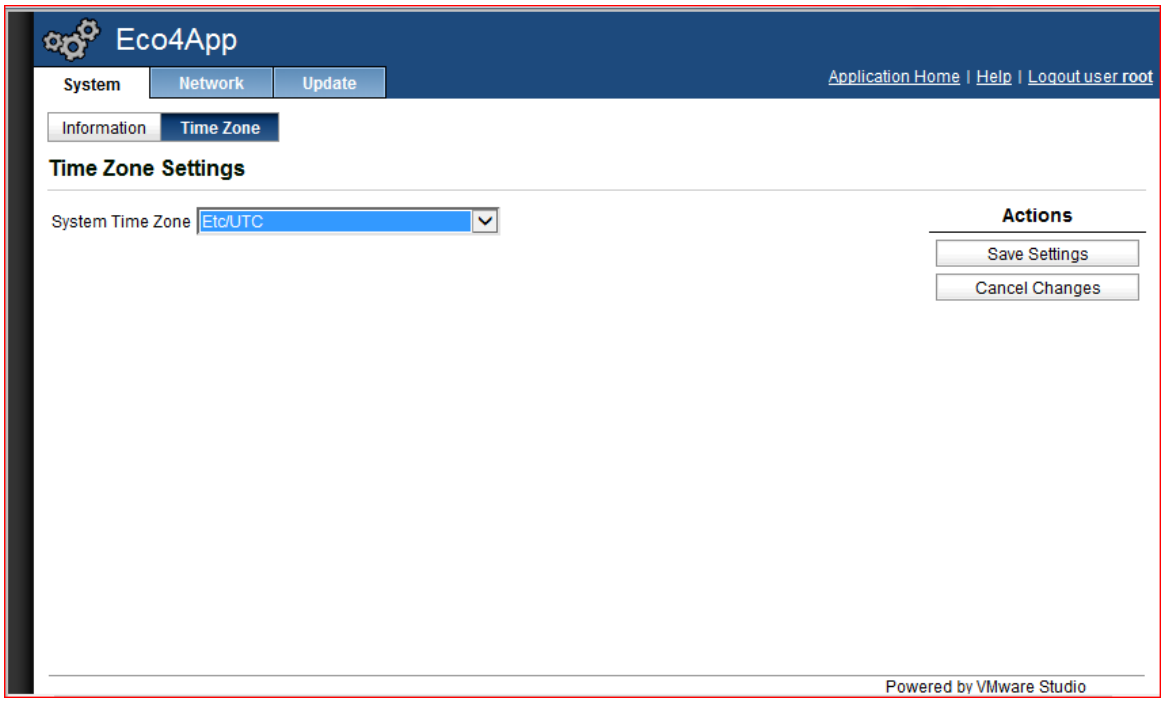


Fig. 18 Time zone modify page

The second tab (Network) is useful to configure network, or better, to modify network settings compared to those entered during vApp installation (Fig. 10).

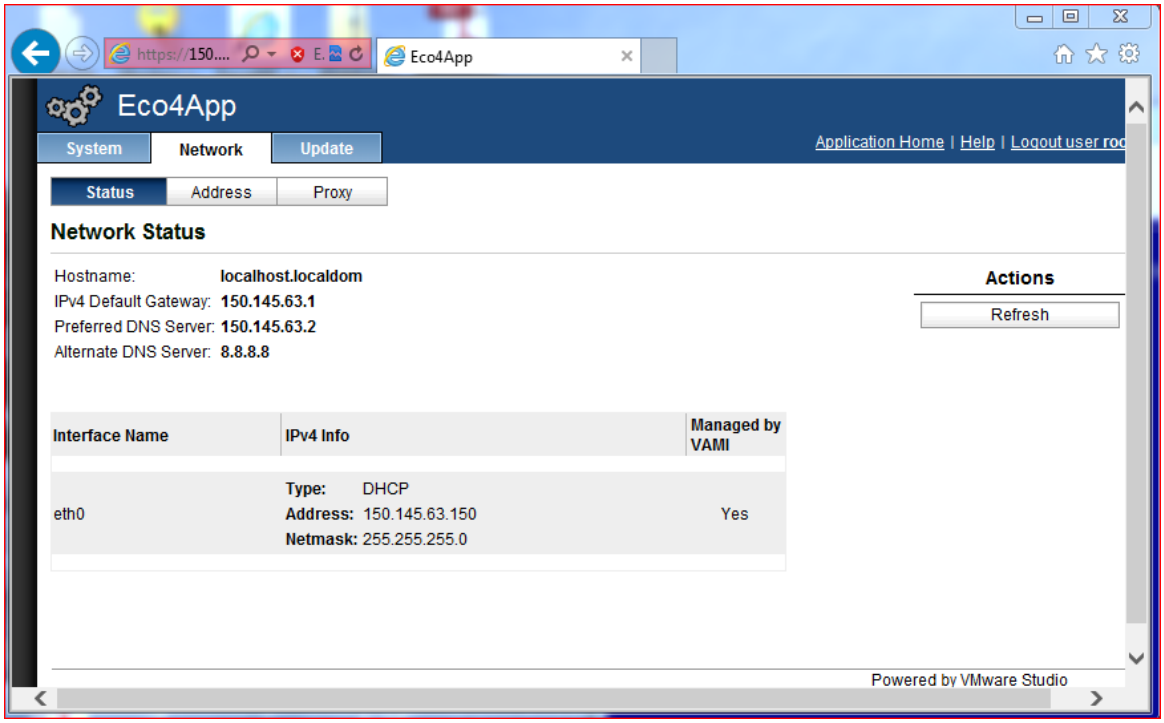


Fig. 19 Network Settings

In the “Status” page, network settings currently used by vApp are available, as IP address, DNS address, etc.

Modifying settings is possible by clicking on the “Address” button (Fig. 20).

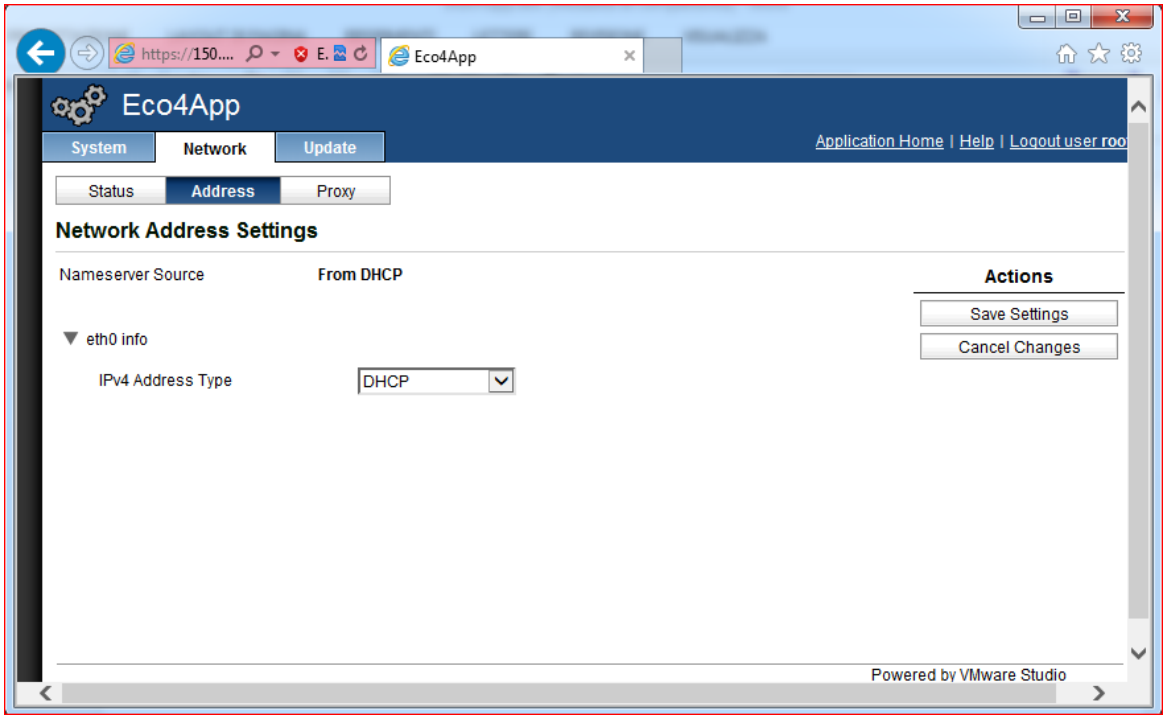


Fig. 20 Network Settings using DHCP

In the example in Figure 20, the DHCP automatically sets up network configuration, but it is possible to configure statically the network choosing a different option in the dropdown menu.

In Figure 21 it is shown how modify the default gateway, the DNS address, the IP address, the subnet mask, and the hostname.

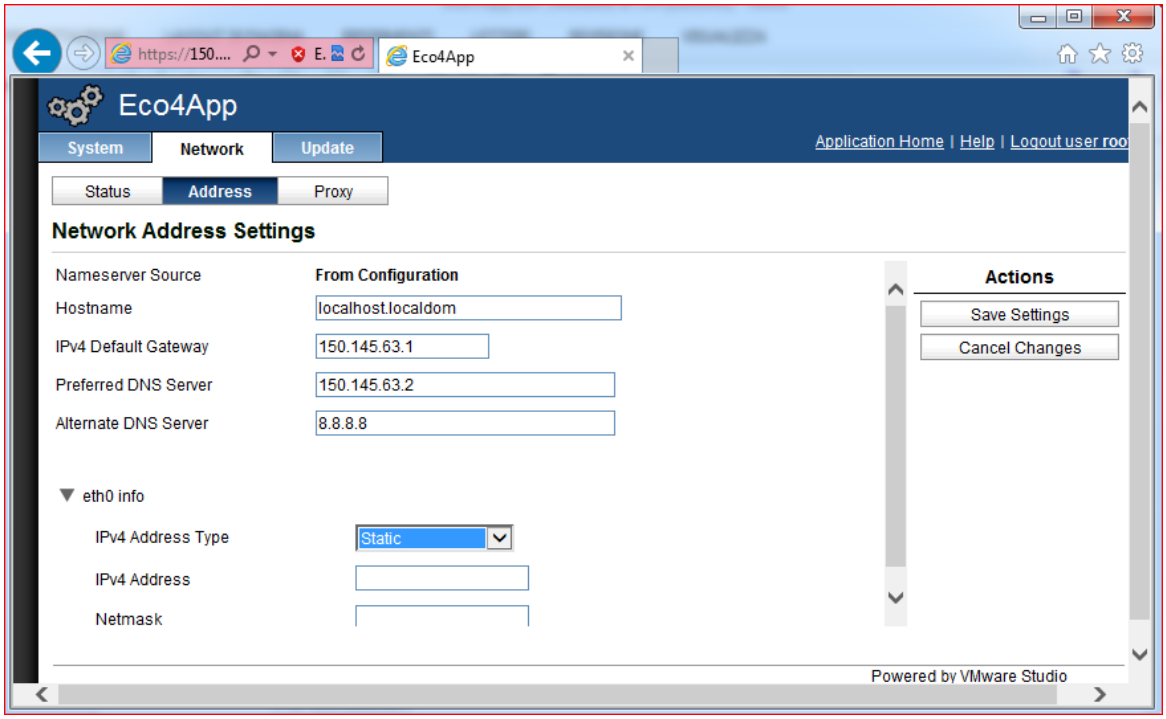


Fig. 21 manual network settings

The last button “Proxy” allows configuring the vApp (Fig. 22) in order to surf the internet using a proxy server. To do so, check the option “Use a proxy server” and enter further requested information as IP address, port, user name and password. Finally, save all new information clicking “Save Settings”.

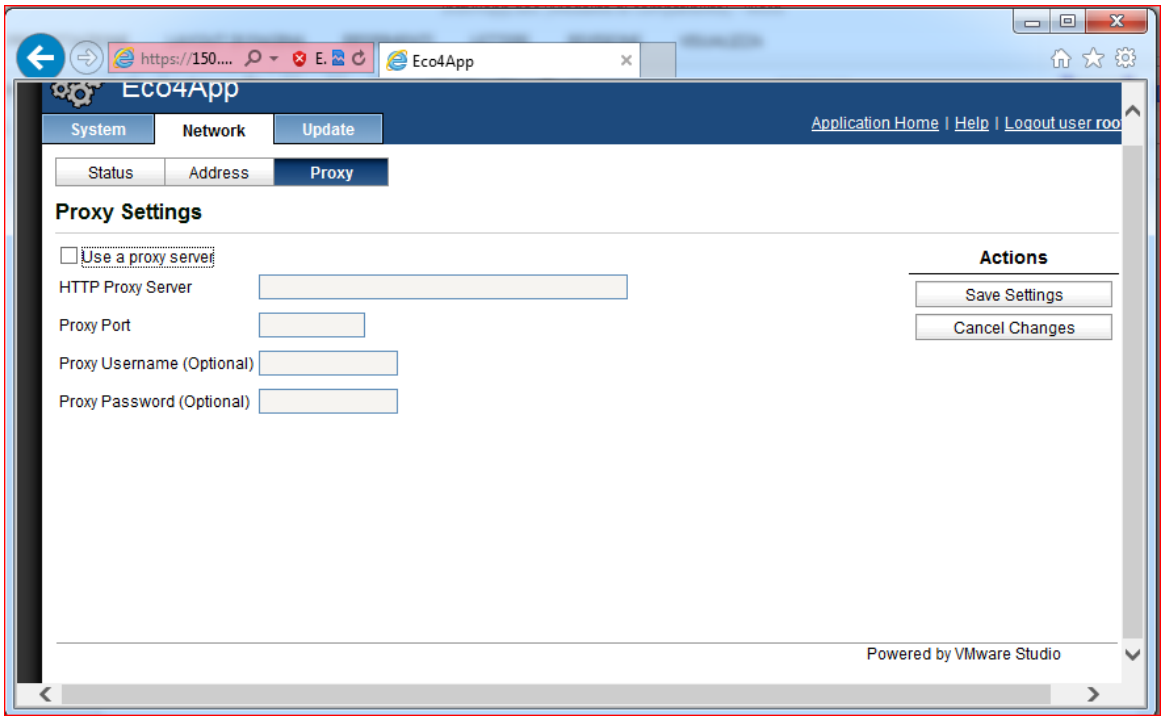


Fig. 22 Proxy server settings

Updates management

One of the best features of vApp is that it can be updated. The updates may include, for example, the addition of modules of the operating system or running a particular configuration script or changes in the Eco4Cloud software.

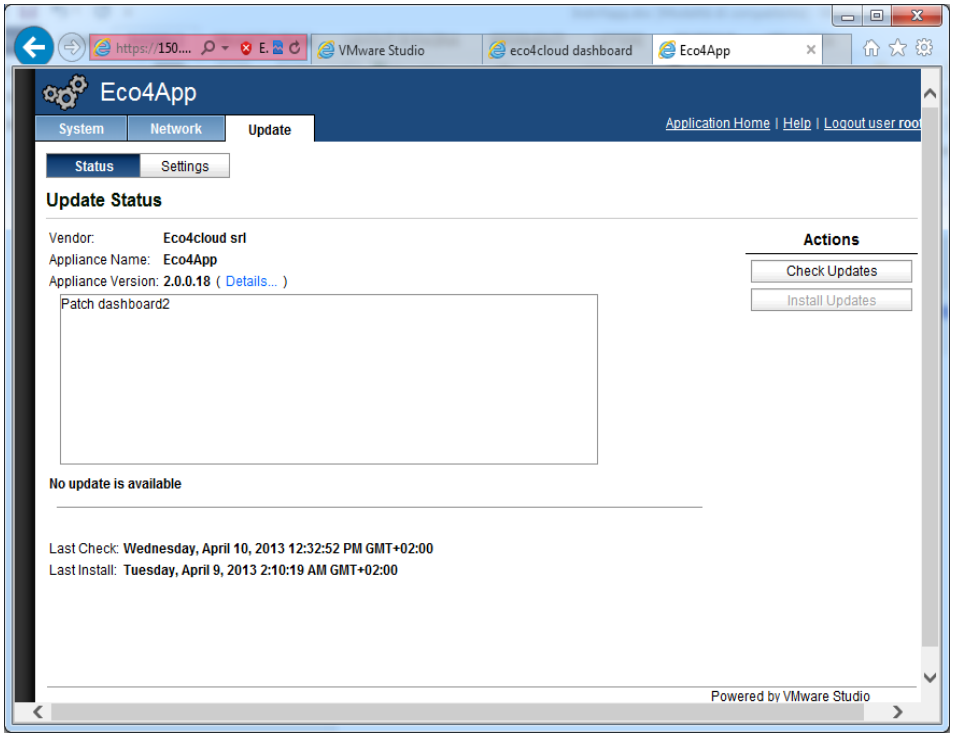


Fig. 23 Update Status and appliance version.

UPDATES MANAGEMENT

By clicking on the “Update” tab, you will see a summary page on the application version. Before you can check for new updates you need to click on the “Settings” button and verify all the parameters.

The configuration page allows you to automate or semi-automate or manual leaving all the updates management. By default, automatic updates are not enabled (Fig. 24).

You can change the settings and choose "Automatic check for updates" with which the vApp periodically checks whether new updates have been published, but not install them. The installation is carried out manually by clicking on the button "Install updates" from the first screen (Fig. 23). Finally, if you want to fully automate you have to select "Automatic check and install updates" and choose the frequency and time.

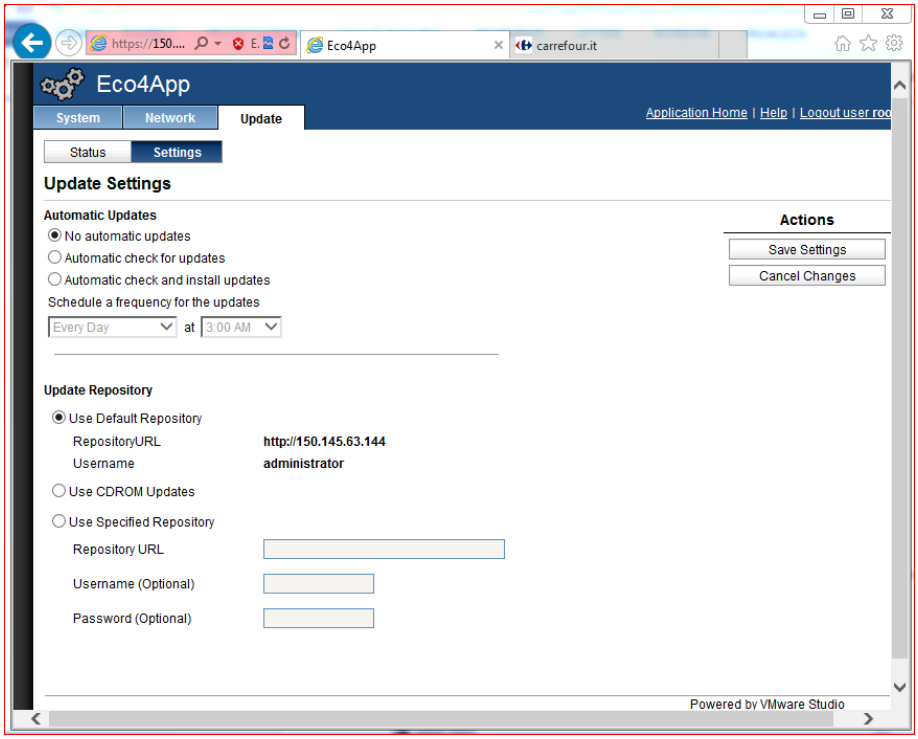


Fig. 24 Automatic updates management

At the bottom of the screen you have to choose the update repository. By default it is configured eco4cloud company repository server. Otherwise, if the vApp does not have internet access, Eco4Cloud will send a CD-ROM with the updates, and then you need to select “Use CD-ROM Updates”. Finally, if the URL of the repository changes, you will need to select “Use Specified Repository”, writing the new url and login credentials.

As stated above, for manual installation or a manual check for updates, click on the “Status” button back to the previous page, and then click “Check Updates” and “Instll Updates” (Fig.25). If new updates are available, anotify appears with the words “Available Updates” and the serial number of the new software version.

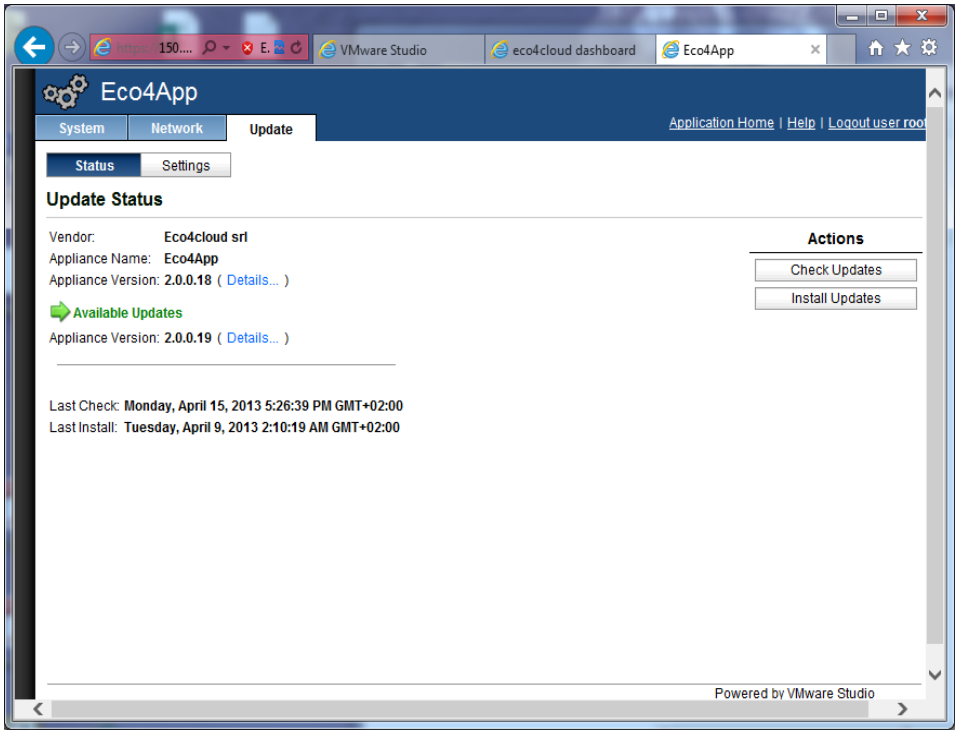


Fig. 25 Updates check

Figures 26 and 27 illustrate the process of updates installation.

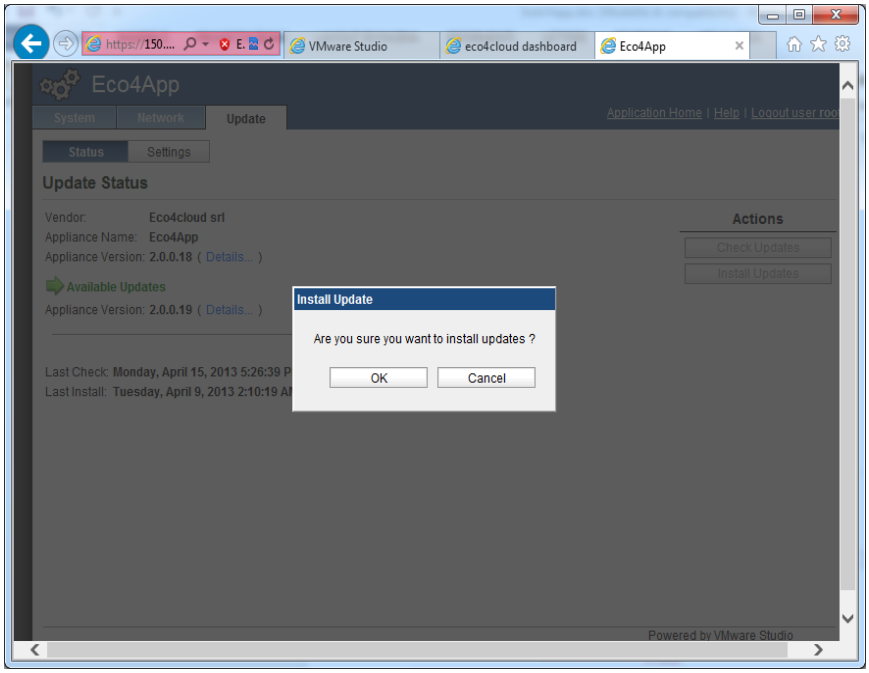


Fig. 26 Update process

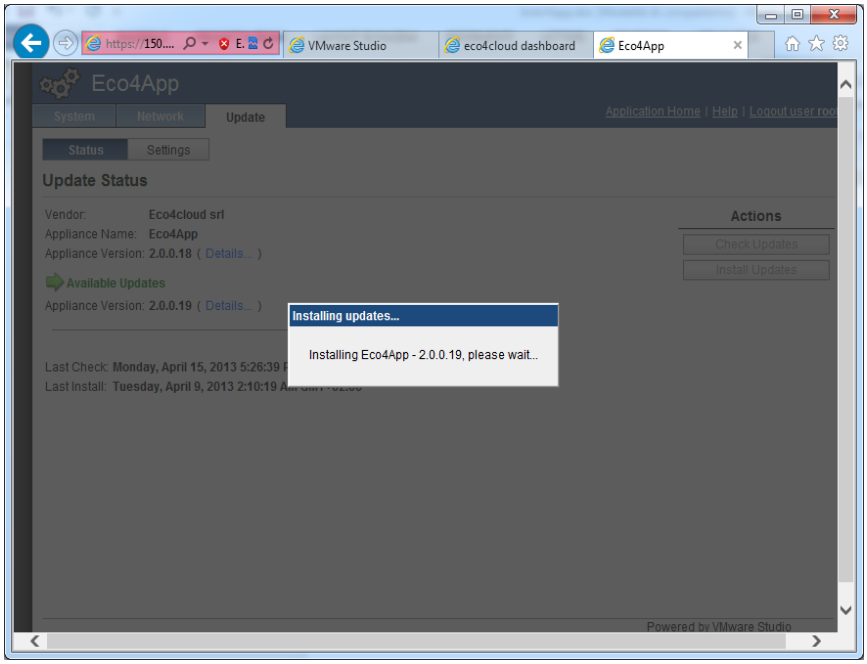


Fig. 27 Updates installation

UPDATES LOGS.

If for some reason the updates were not installed properly will need to check the logs. In order to do this, you need to access the console or via ssh to vApp and read files updatecli.log and vami.log in the */opt/vmware/var/log/Vami* folder.

SETUP OF A PROXY UPDATE SERVER

It's possible to maintain independently a proxy server for Eco4cloud vApp updates management. The only prerequisite is to have a web server available. In case of Windows environments the web server may be **IIS** web server, in case of Linux environments this may be **Apache** web server.

Once you have successfully configured the web server, simply copy the two folders for managing updates, **manifest** and **package-pool**, in the web server root folder. These will be sent in a zip file. The customer has to properly explode it in the root of the web sever. The example below shows a possible configuration.

A "Ecorep" site was created and the two folders, **manifest** and **package-pool**, copied in it. In this example the Ecorep site is available via the url http://<name-of-server> or http://<server-ip-address>.

All the network communications will take place through HTTP protocol on TCP port 80.

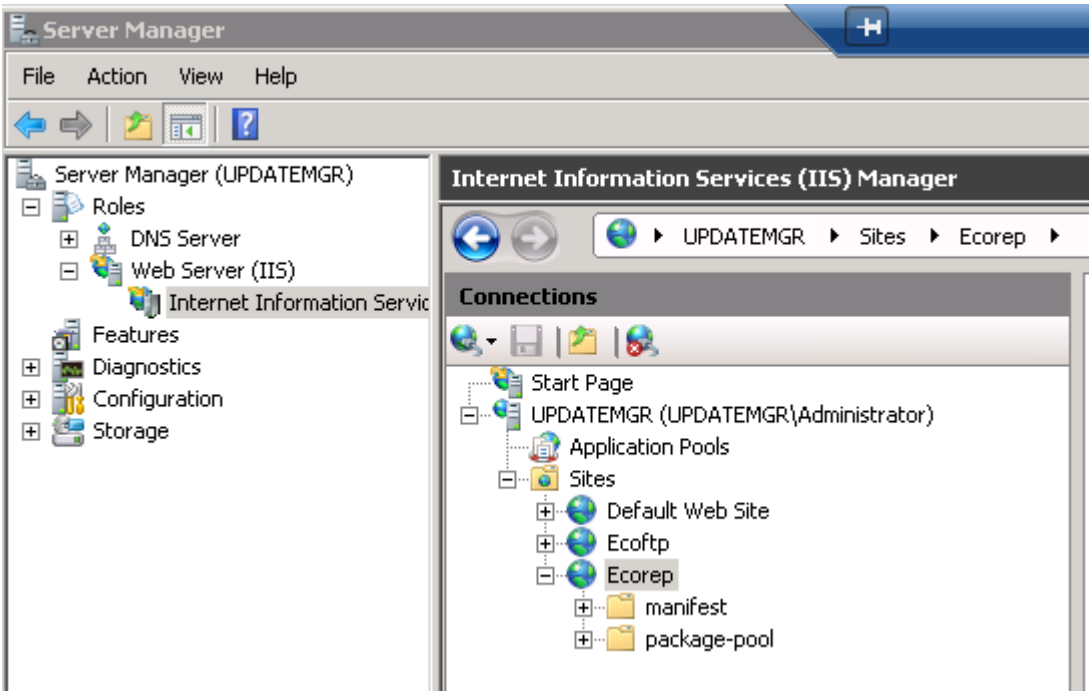


Fig. 28 Example of IIS configuration for update

Initial setup of Eco4Cloud dashboard

Once Eco4Cloud virtual appliance is installed, it is possible to access it remotely, via browser, entering the url https://IPaddress of the virtual machine, either assigned by DHCP, or entered manually.

The first requirement is to log in the Eco4Cloud dashboard, filling the module shown in Figure 29. Each Eco4Cloud virtual appliance comes with the following default credentials:

- User name: **admin**
- Password: **cloud4eco**

After logging in for the first time, it is required to configure the Eco4cloud dashboard following a simple wizard.

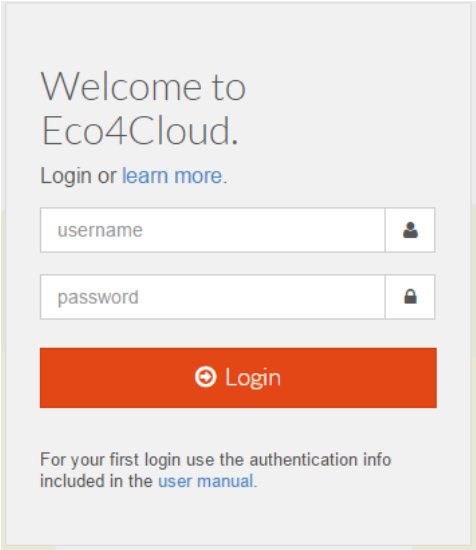


Fig. 29 Eco4Cloud Dashboard Login

The first step is to change admin password.

You also have to compile a form (Fig. 30) with company info, such as Company name (the only mandatory field), company website, a brief description of the company, and finally you can add Company logo

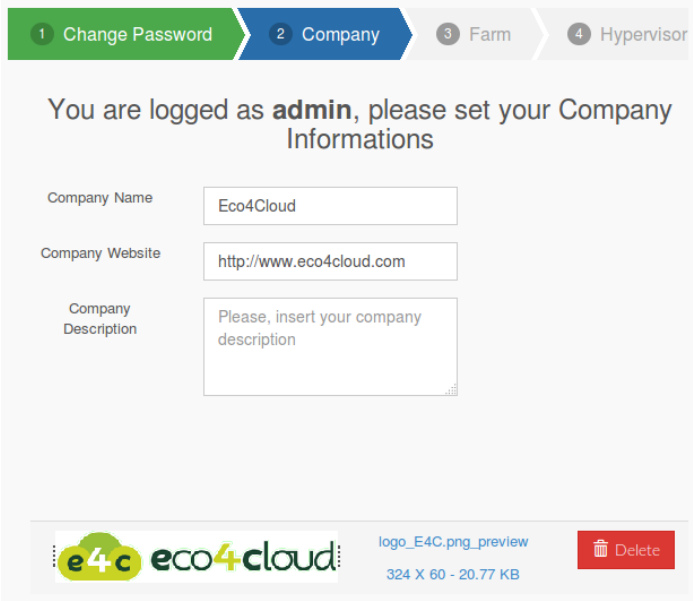


Fig. 30 First login form

The next step is to configure your Server Farm, inserting a Farm Name and a brief description (Fig. 31) useful if you will work with several farms at the same time.

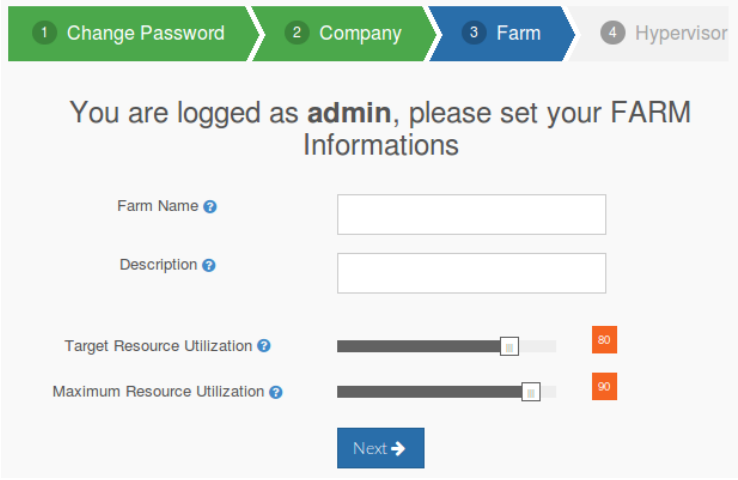


Fig. 31 Farm Information

Moreover, there are other two parameters:

- **Target Resource Utilization**: The percentage of host utilization (CPU, RAM) that Eco4Cloud Workload Consolidation will try to achieve. Default value is 80%;

- **Maximum Resource Utilization**: The maximum host utilization (CPU, RAM) allowed. If Exceeded, Eco4Cloud Workload Consolidation will migrate VMs to other hosts. Default value is 90%.

In the next step another form (Fig. 32) collect data about your virtualization platform such as Ip address, username and password to gain access to your virtual farm.

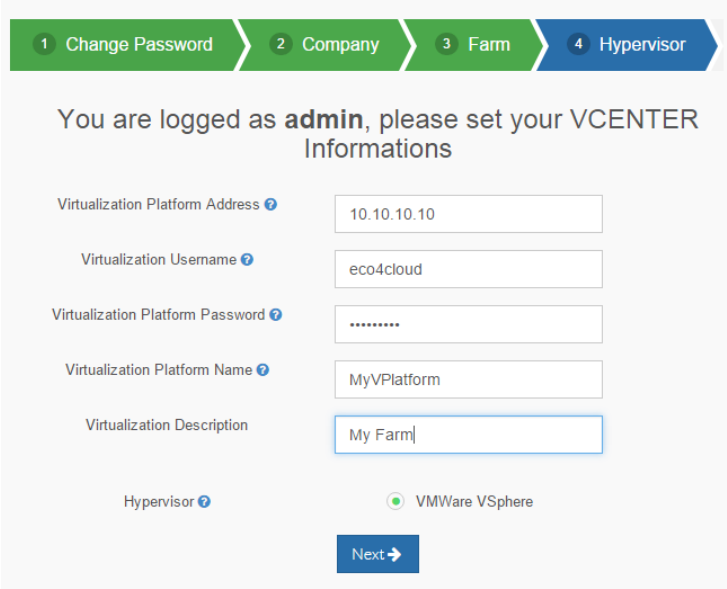


Fig. 32 Virtualization Platform information

After clicking on next button, you can configure your smtp server (Fig. 33) settings (you can configure it afterwards as explained in the Mailer paragraph of Administration panel section of this manual) or skip this step and begin to use the dashboard.

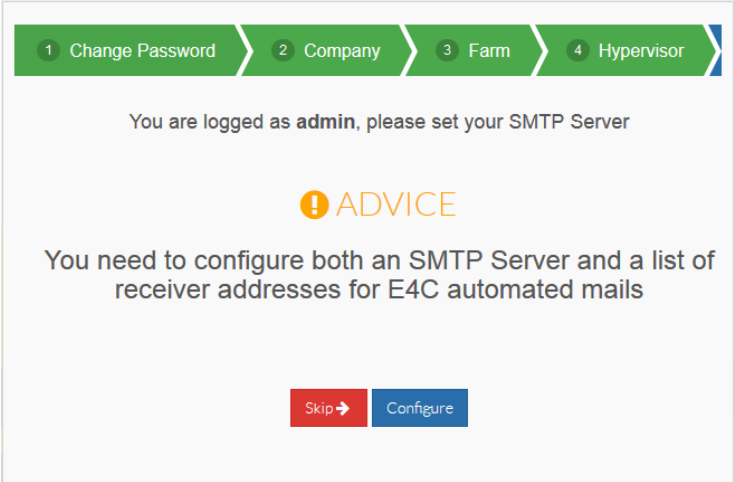

1 Change Password
2 Company
3 Farm
4 Hypervisor
You are logged as admin, please set your SMTP Server
ADVICE
You need to configure both an SMTP Server and a list of receiver addresses for E4C automated mails
Skip
Configure

Fig. 33 Smtp configuration

Monitoring

When the user logs into the dashboard all Eco4Cloud products (Monitor, Workload Consolidation, Troubleshooter, CDSM) appear on the top of the page. At the very beginning, only **Monitor** product is active and free for use.

Once the configuration wizard is completed, monitoring become to collect performance data (Fig. 34).

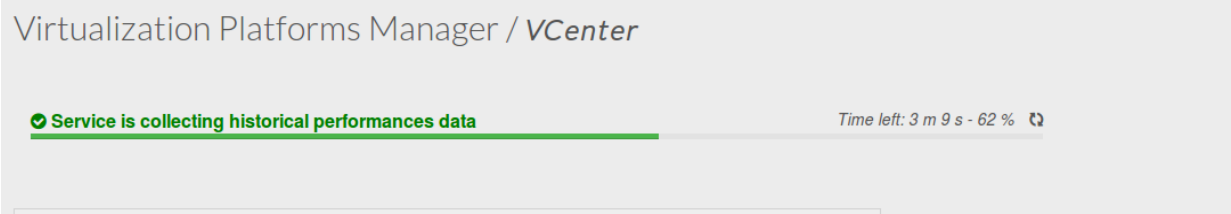


Fig. 34 Performances data collection.

When historical performances data are completely collected, you can see the resources inventory of your **farm** on the top left side of the home page.

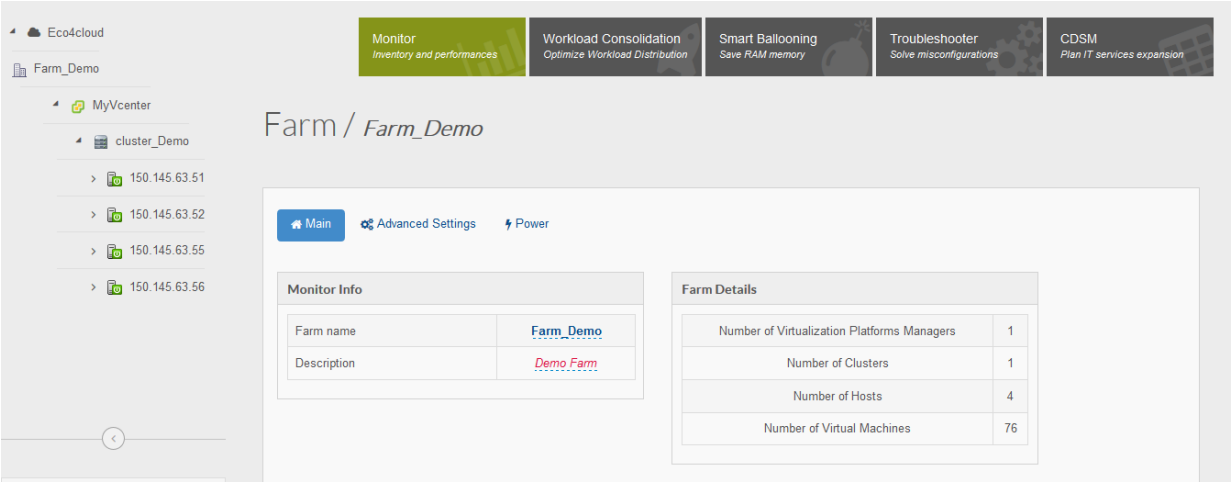


Fig. 35 Dashboard Home

You can change any Virtualization Platform information, including Virtualization Platforms Manager name and description, IP, username or password, by clicking on **Virtualization Platforms** in the resources inventory and then on Advanced Settings. After modifying parameters, you can click on **update** button.

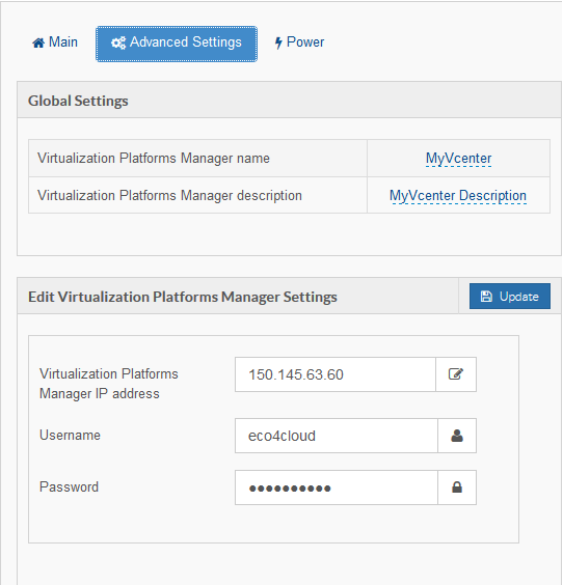


Fig. 36 Performances data collection.

In the **Main** tab the three following charts are available: **Cpu and Ram utilization**, **Performances**, **Cpu Ready Time** and **Ballooned Memory**. **CPU Ready time** is a metric showing how much time virtual CPU is ready to be scheduled on the physical host. **Ballooned Memory** is the RAM Memory reclaimed by Vmware balloon driver. The user can monitor both performance metrics, allowing to know when they get too high: this is a symptom of contention on CPU and memory, respectively.

RESOURCE MAIN TAB

After selecting an resource in the **resource inventory** on the left side of main window, further information and details will be shown in the right pane. For example, clicking on a host (Fig. 37) the status of VMs belonging to will be shown. Moreover **Host Details** pane will show some hardware and software information about the host.

Host Properties

Number of Powered ON VMs	5
Number of Powered OFF VMs	10
Number of Suspended VMs	0
Number of VMs Templates	1

Host Details

Virtualization Software Version	VMWare 5.0.0
Host Power State	Powered On
Vendor	Supermicro
Model	X8DTT-IBX
Processor Model	Intel(R) Xeon(R) CPU E5520 @ 2.27GHz
Number of CPU Sockets	2
CPU Frequency	2266.00 MHz
Number of CPU cores	8
RAM	24 GB

Fig. 37 Resource properties

RESOURCE POWER TAB

The second tab is **Power** tab(Fig. 38). The chart shows the power consumption of the hosts compliant with the power consumption monitoring feature

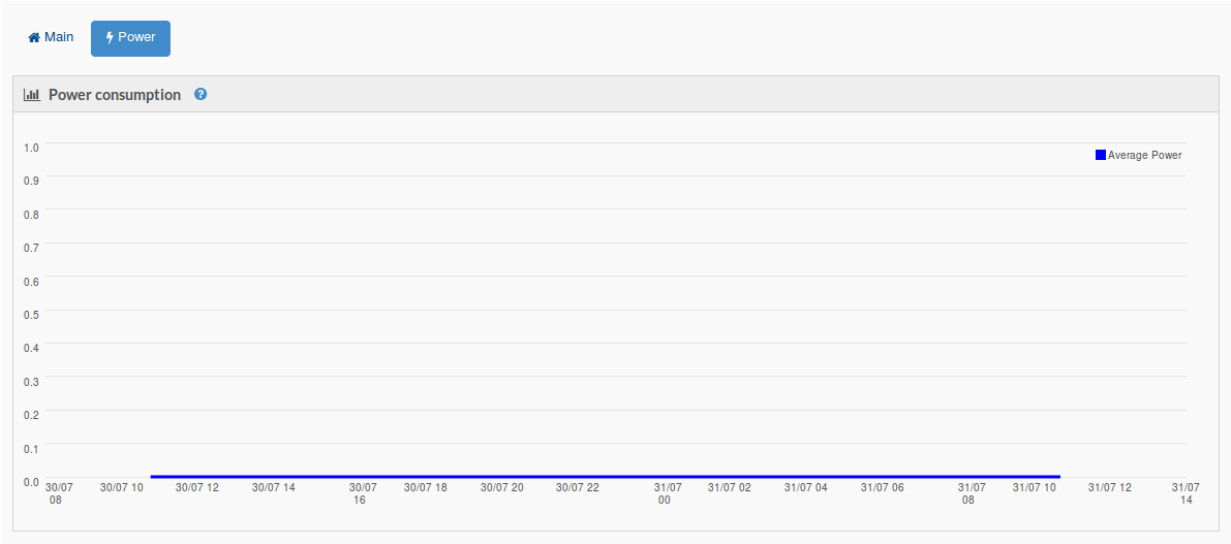


Fig. 38 Power consumption

CONSOLIDATION SCENARIOS

It is a feature that allows to simulate Eco4cloud Workload Consolidation in your own farm. After clicking on your company a page with **Consolidation scenarios** tab appears. In this pane you can find the **New Consolidation Scenario** button (Fig. 39) and a list of the previous consolidation scenarios.

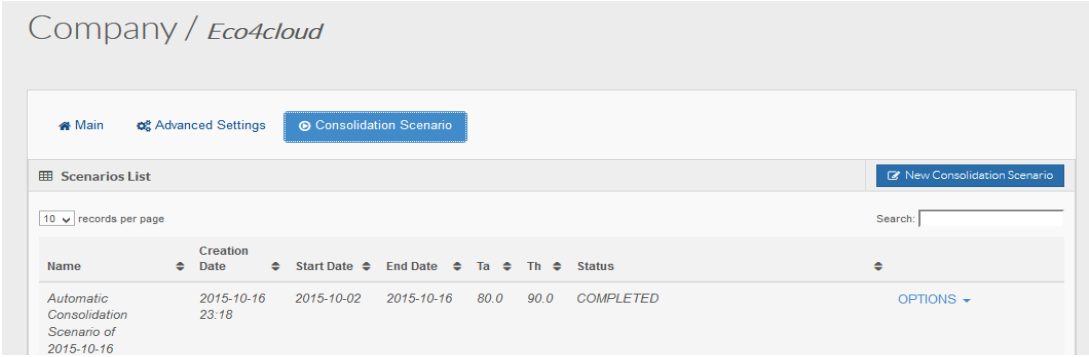


Fig. 39 Simulation list window

After clicking on **New consolidation scenario** button, a wizard pops up to configure a new simulation (Fig. 40). First of all select the farms of the scenario.

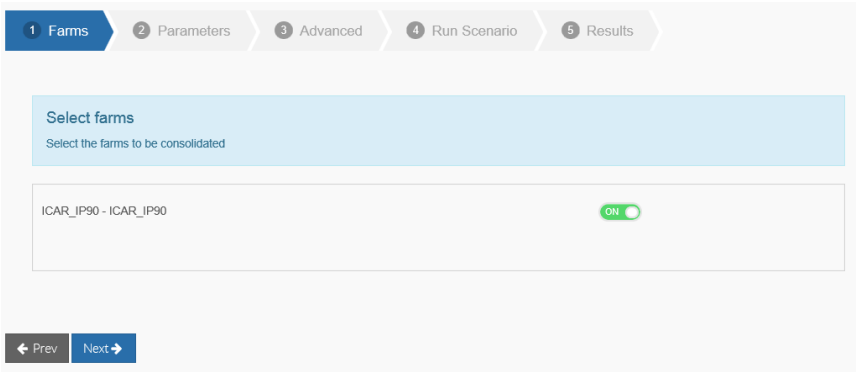


Fig. 40 Simulation list window

In the next step, fill the **Simulation name** field, **Target Resource Simulation** (E4C Workload Consolidation will optimize host utilization up to this value) and **Maximum Resource Utilization** (E4C Workload Consolidation will migrate VMs away from hosts with utilization rates higher than this value) finally choose **Start Date** and **End Date** (both not older than two weeks) of simulation (Fig. 41).

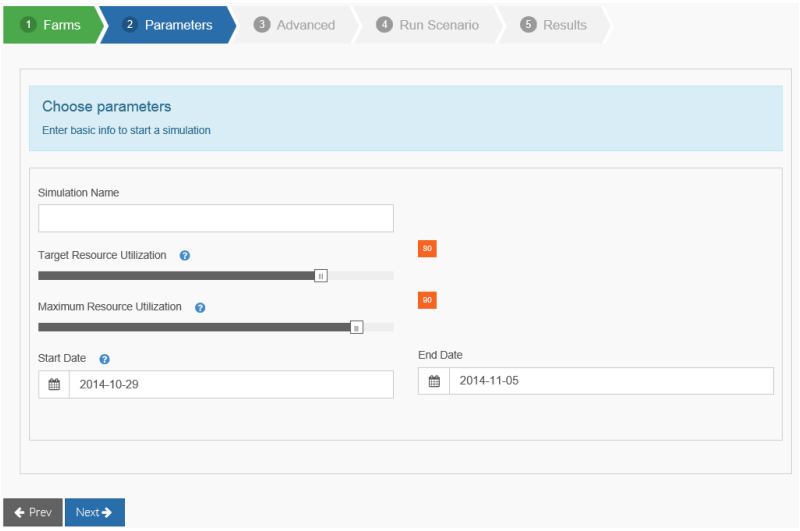


Fig. 41 Simulation Parameters

In the next step, **Advanced settings** of clusters, servers and VMs can be set. For servers and VMs you can decide to switch on/off **Consolidation** and automated **StandBy** for idle hosts**,** for each **cluster** you can set the minimum host number that must be always on (Fig. 42).

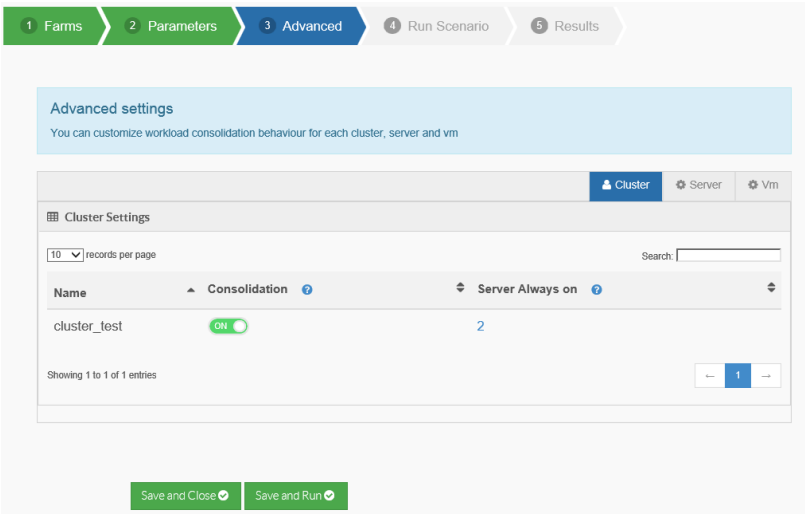


Fig. 42 Advanced simulation Parameters

Clicking next, simulation runs and results are shown.

MONITORING

SIMULATION RESULTS

The results are divided in four sections: **Test Description**, **Resources utilization without Eco4Cloud**, **Resources utilization using Eco4Cloud and an appendix with scenario parameters details .**

Resources utilization without Eco4Cloud

This section reports four graphs:

- The first chart is **Average CPU and RAM utilization of the hosts before using Eco4Cloud** and it shows the average CPU utilization of the hosts during the monitoring period. It also shows the average RAM allocation (again in percentage with respect to the total amount of RAM) of the servers.
- The second chart is **Average power consumption of each server.** Eco4Cloud is able to collect hosts power consumption data, so the overall power consumption of the physical hosts in the data center and the overall energy consumption per host per day can be reported.
- The third chart reports the **CPU ready time**. VMWare has set two thresholds for the CPU ready time of a VM: 5% is a warning threshold, while 10% represents an alert.
- The fourth chart reports the **amount of ballooned memory**. VMWare specifies that the presence of ballooned memory should be avoided, even if a small presence of memory ballooning is not a sign of serious memory contention

Resources utilization using Eco4Cloud

This section includes two charts:

- The first chart is the **Number of active servers with and without Eco4Cloud** (Fig. 43) and it reports the number of active servers, with and without the use of Eco4Cloud.
- The second chart is the **Number of overload prevention and workload consolidation migrations per hour** and it reports the number of migrations per hour in the whole data center during the week of simulated Eco4Cloud operations.

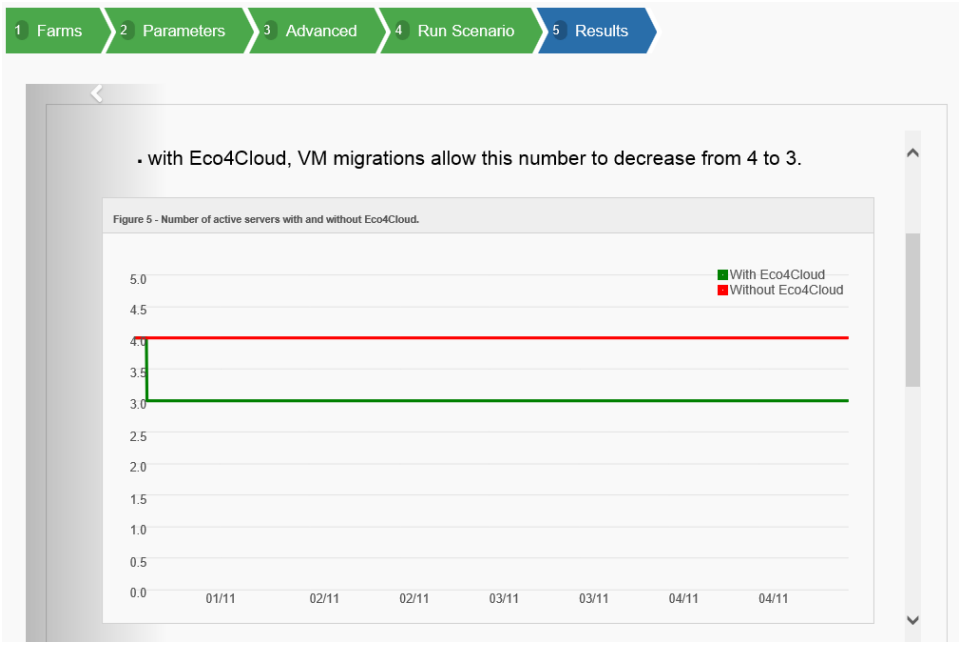


Fig. 43 Number of active servers with and without Eco4Cloud

Administration Panel

In the right top of home page, there is the Menu' for **changing** admin **password**, **logout** from session and **Administration panel**.

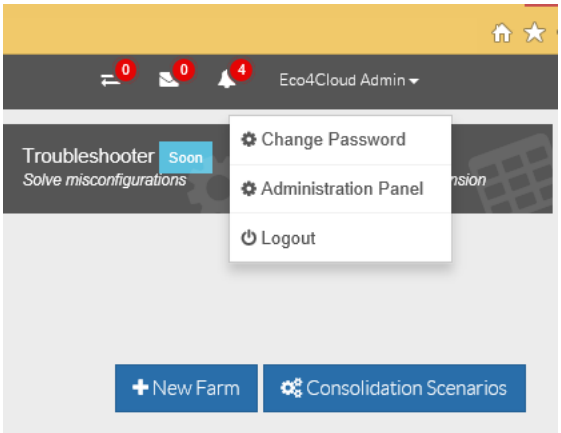


Fig. 44 Right top Menu

The administration panel allows you to manage **products licenses**, **mailer**, **users, Advanced configurations** and **Support.**

LICENSES

In the license section, you can find all licensed products, license expiration date, number of hosts supported, current active licenses, residual licenses number and the license status. To add or upgrade a license you have to contact Eco4Cloud by clicking on **Request License** button. A pre-compiled form appears and you have just to specify which product you want to license, then press **Send** button to email to eco4cloud support your request. If you haven't configured the smtp server in the mailer section yet, you have to compile the form and then click on the link just below send button and follow the instruction.

MAILER

The Fig. 45 shows mailer configuration panel. Eco4Cloud sends periodical reports of its activity and immediately notifies users of possible malfunctions. In order to obtain this service, the user needs to configure the mail service.

Host name, **port**, **sender mail** and **sender name** are mandatory fields. If you enable Server Authentication, you have to fill **Username** and **password** field too. If you use an SMTP server that requires an encrypted session, you have to switch on **SSL Connection**.

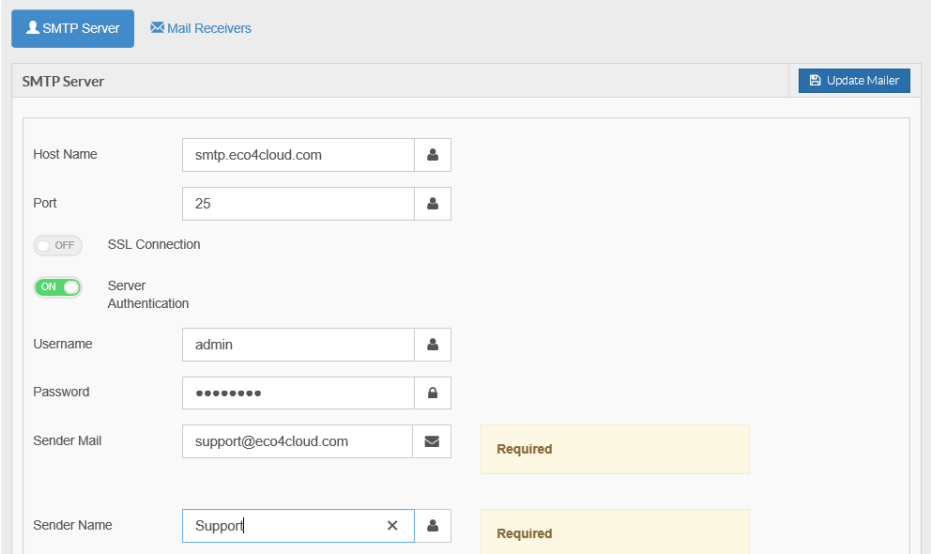


Fig. 45 Mailer configuration

In the **Mail receivers** section you can add the email address of users that will receive **Reports**, **usage data**, **Errors** generated by eco4cloud service. The section also to modify/remove a recipient (Fig. 46), and to enable or disable the message dispatch of each category.

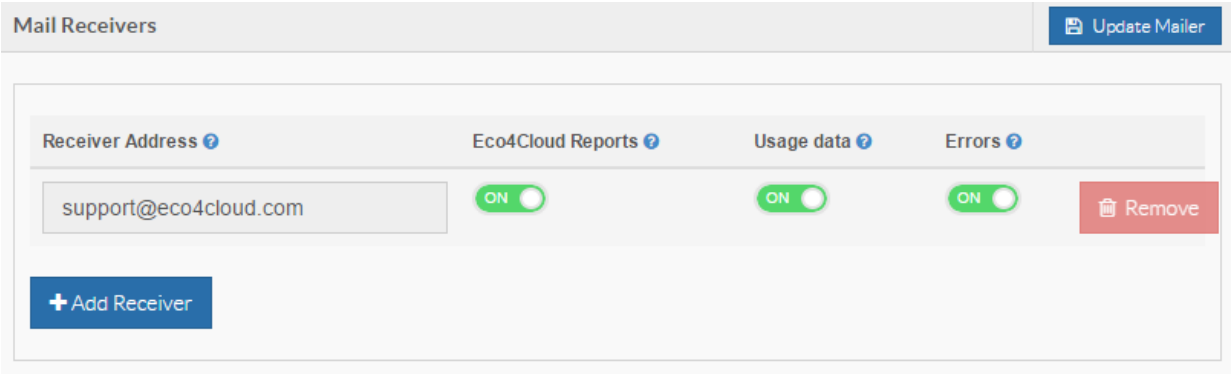


Fig. 46 Mail Receivers

COMPANY INFO

The **company info** section (Fig. 47) shows the information about your company. All data can be edited. After completing click on update company button to save your changes.

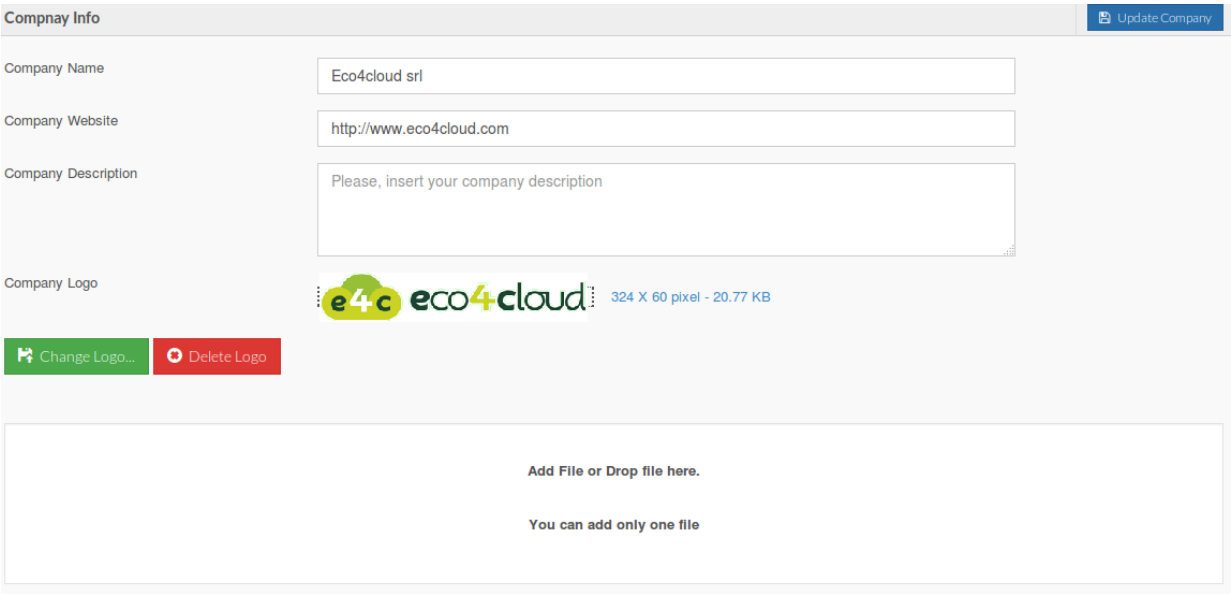


Fig. 47 Company info

ADVANCED CONFIGURATIONS

This section shows other advanced configurations of Eco4cloud dashboard (Fig. 48). The first switch permits to install Eco4cloud plug-in in the vClient. After switched on a new eco4cloud item appears when you right click an resource as a host or a VM. By clicking on Eco4cloud menu' you can manage all Eco4cloud parameters from vmware vclient.

Performance Data Interval, permits to specify the number of days (starting from now to backward) in order to save performances data on database. Performances data are used to run consolidation scenarios and/or CDSM scenarios. More days require more datastore allocation for eco4cloud Virtual appliance.

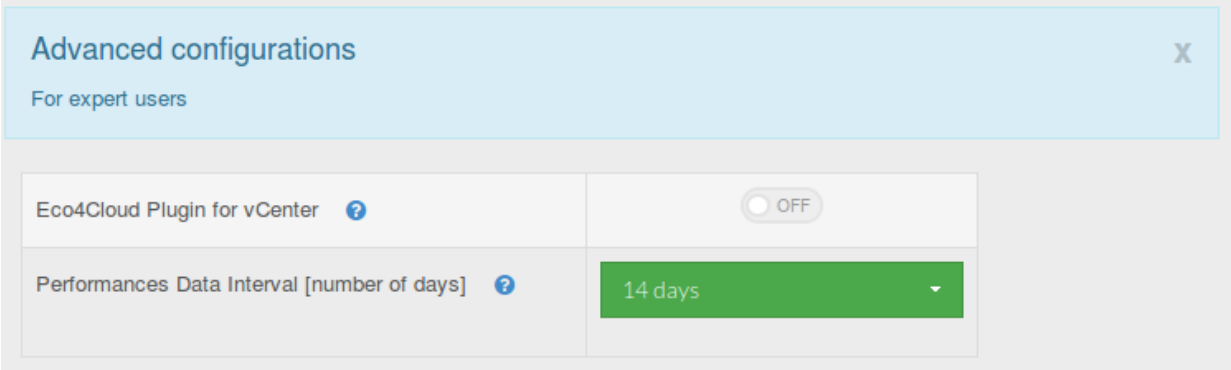


Fig. 48 Advanced configurations

USERS

This section shows the list of Eco4Cloud users. By clicking on **Add User** button, a new user wizard . Fill the fields in the first part of wizard with the user data information, then set its permissions as Fig. 49 shows. A user could have Administrator permissions (i.e. Full Control on selected farm), read only or read/write permission. Finally confirm data. After creating a new user, you can modify its permissions by clicking **edit** link.

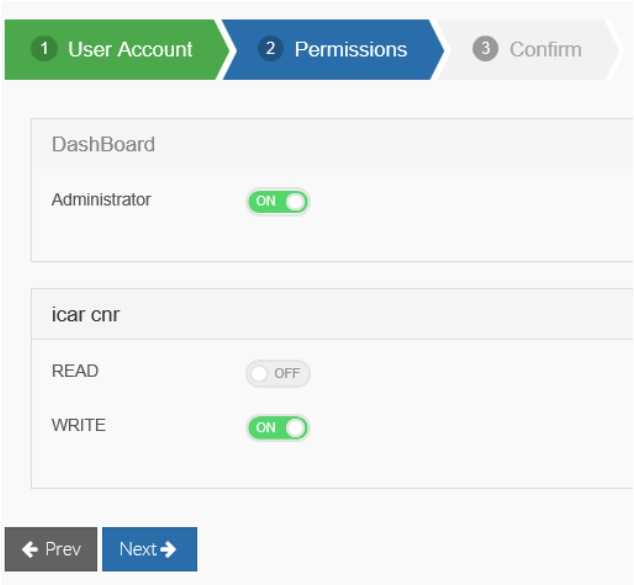


Fig. 49 User Permissions

HEALTH STATUS

In the **health status** section you can control if the E4C services are running.

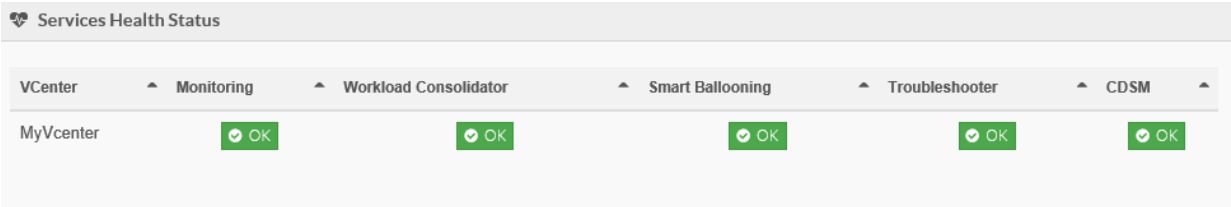


Fig. 50 Services Health Status

The table (Fig. 51) below service health status shows the user permissions that eco4cloud user has to have so that all services work properly.

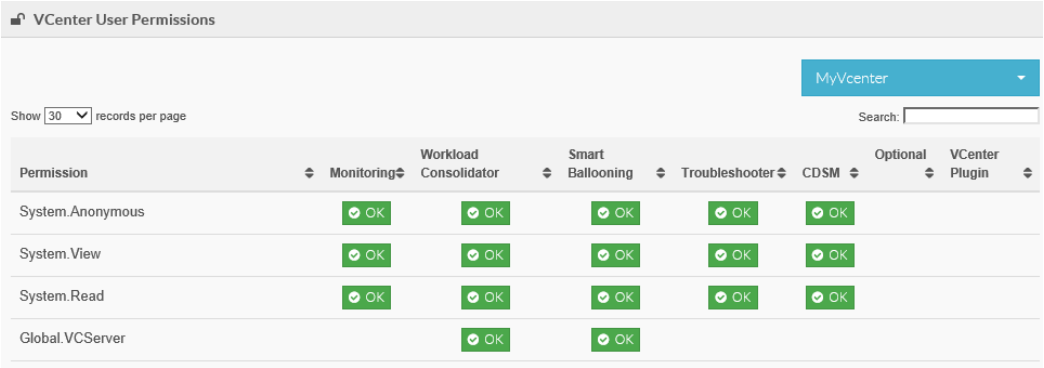


Fig. 51 Eco4cloud user permission

SUPPORT

This section gives the opportunity to generate (by pressing **Generate** button) the Eco4cloud application log and download (by pressing **Download** button), the generated tar.gz file to desktop. This file can be sent to support@eco4cloud.com to control Eco4Cloud anomalies or errors. By switching on **Obfuscate content Data Base** (default is **OFF**), datacenter private data are not written into logs and not showed to Eco4Cloud support.

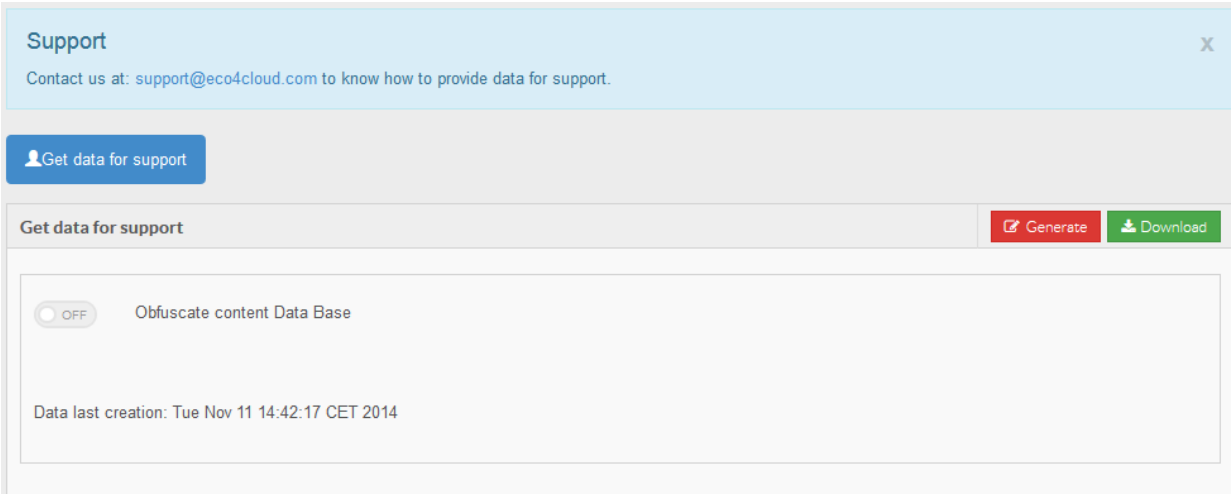

Support
Contact us at: support@eco4cloud.com to know how to provide data for support.
Get data for support
Get data for support
Generate
Download
OFF
Obfuscate content Data Base
Data last creation: Tue Nov 11 14:42:17 CET 2014

Fig. 52 Support section

SOFTWARE UPDATES

This section gives the opportunity to upgrade software (Fig. 53). After Eco4cloud support sends you the **zip** file containing updates, you have to click on **Upload Patch file** button.

Then selects the package and waits for the upload to finish.

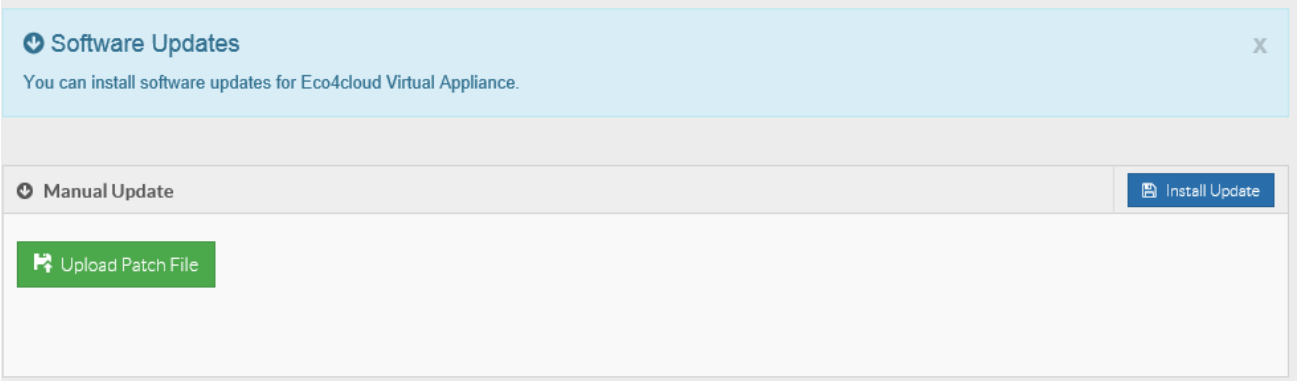


Fig. 53 Software Updates

By pressing Install Update button the vapp will be upgraded to new version. Logout and login again to navigate in the dashboard.

MIGRATIONS, WARNINGS AND ERRORS

In the right top of home page, there are three icons representing respectively **Migrations**, **Warnings** and **Errors** (Fig. 54).

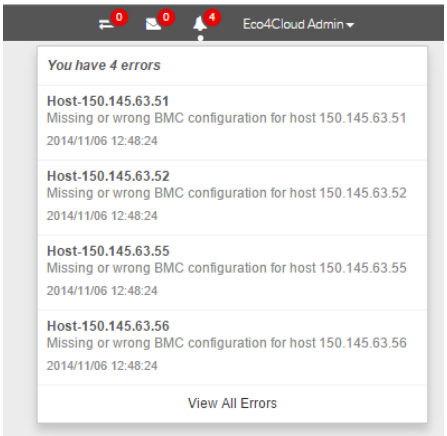


Fig. 54 Errors

By clicking on view all errors, you can see more details. In the same way, you can view warnings and migrations.

SEARCH RESOURCES

In the Left top of home page there is the search box (Fig. 55). Simply inserting part of name of an resource such as a cluster or VM, search function will list all resources containing typed character.

Fig. 55 Search

Workload Consolidation

Workload Consolidation requires you insert a license. In order to obtain a valid code, contact Eco4Cloud support at support@eco4cloud.com, go to **Administration Panel**, click on **Licenses**, then **Add licence** and insert it. After that, click on **Workload Consolidation** button and select a farm previously configured. Enabling Consolidation, Eco4Cloud will be able to migrate VMs between hosts inside this farm and switch on/off hosts (if BMC are correctly configured in **power management** section in VMware vClient).

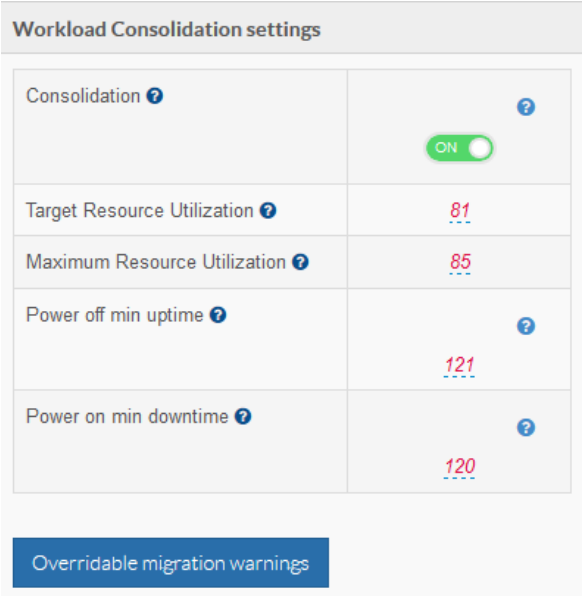


Fig. 56 Workload Consolidation Settings.

Fig. 56 shows workload consolidation settings. You can enable or disable consolidation with the appropriate switch. You have to specify the reason (at least 10 characters) of the operation and finally confirm. You can also change:

- **Target Resource Utilization**, the target percentage of hosts' resource utilization to be reached through virtual machines consolidation;
- **Maximum Resource Utilization**, the maximum percentage of hosts' resource utilization to be reached through virtual machines consolidation. If the resource utilization goes above this threshold, virtual machines migrations will be issued to lower the utilization;
- **Power off min uptime**: Minimum number of minutes of activity before a host can be powered off (default: 120)
- **Power on min uptime**: : Minimum number of minutes of activity before a host can be powered on (default: 120)

By enabling consolidation on farm, all the resources in the **resource inventory** will inherit this property. If you don't want consolidation be active for some resource, it can disabled separately. On the contrary, if consolidation is disabled on farm, automatically it is disabled on entire **resource inventory**.

Override Migration warnings button shows a warning's list that could be ignored during VMs migrations. You can switch on/off nearly every warning based on your polices (Fig. 57). For example: Eco4Cloud wants to migrate a VM and a "No guest heartbeats" warning stops the migration. In this scenario, if the switch is on the "on" position, the warning will be overridden and the migration can go on.

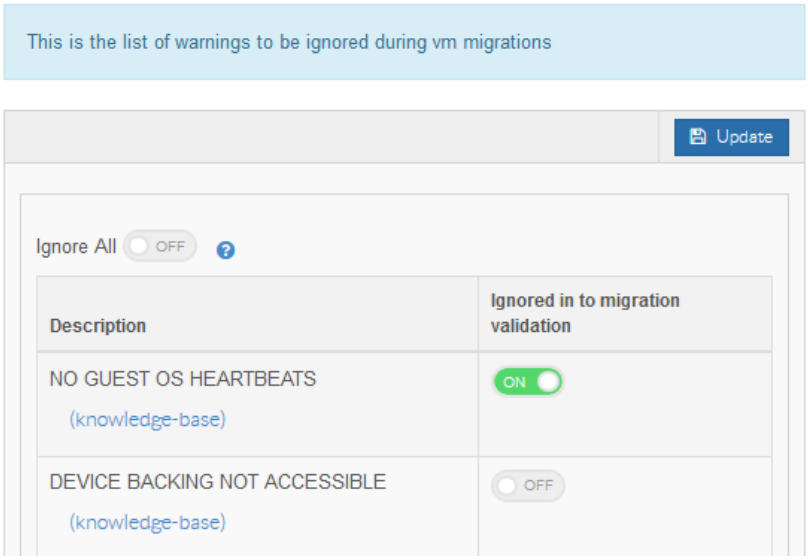


Fig. 57 Override Migration warnings

New Vcenter button allows to add a new vCenter server. You have to fill the form (Fig. 58) filling **Server Host** field with IP address or hostname, then **username** and **password** of an administrative account, and finally press **Update** button.

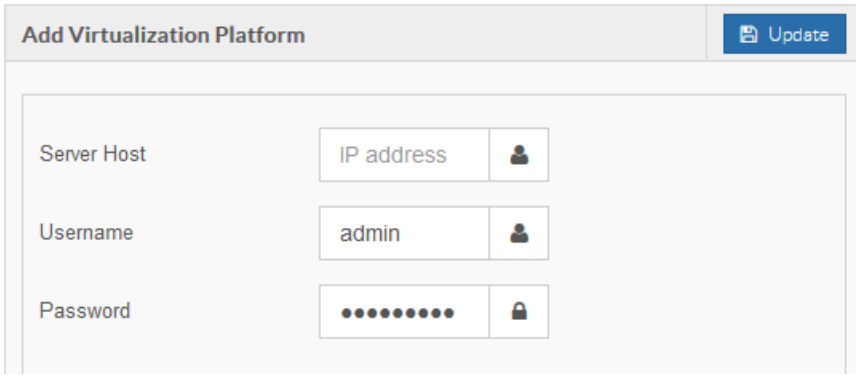


Fig. 58 New Vcenter

This configuration data can be modified/deleted afterwards, selecting the vCenter in the left pane.

New Domain Controller button allows to add a new Domain controller to manage Microsoft Hyper-V environments. Finally, you can also delete a Datacenter.

SETTINGS ON CLUSTER, HOST AND VM

Depending on the selected resource in the left pane, the Workload Consolidation settings pane has a second different field other than consolidation switch.

- For clusters: **Always-on hosts** field is the minimum number of hosts that must be always switched on in this cluster
- For hosts: **StandBy Enabled** field. If it is disabled and Consolidation is enabled on this server, Eco4Cloud will be able to migrate VMs (in/out this server), but the server will never be switched off.

CHARTS

Selecting a farm, or a cluster, additional information is available, a chart and two tables respectively: **Number of active hosts with and without Eco4Cloud, Host Switch On/Off Events, VM Migrations**

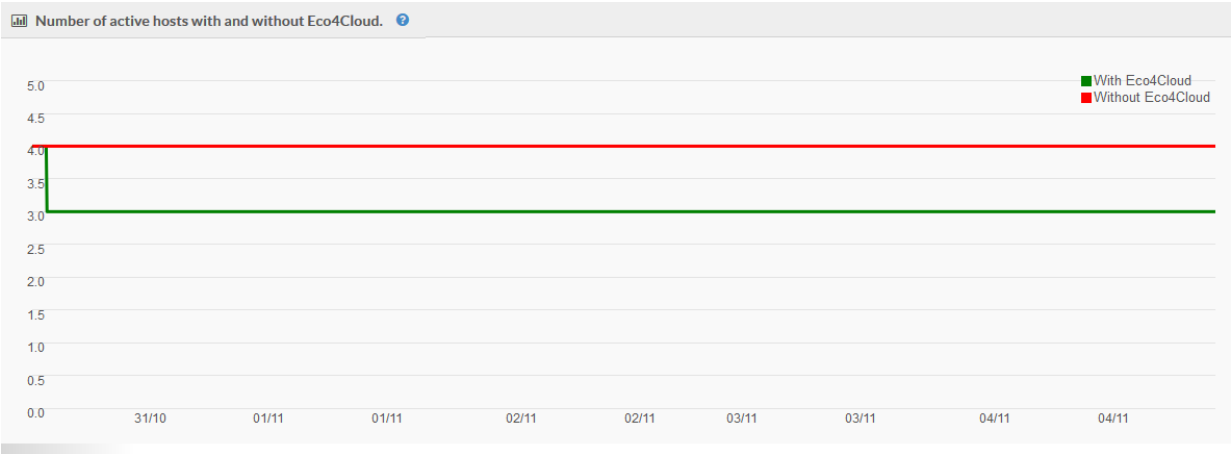


Fig. 59 Number of active hosts with and without Eco4Cloud graph

The chart in Fig. 59 reports the number of active servers with and without the use of Eco4Cloud.

The table **Host Switch On/Off Events** shows which hosts, and when, E4C Workload Consolidation switched on/off.

The last table **VM Migrations** (Fig. 60) shows the VM migrations issued by E4C Workload Consolidation.

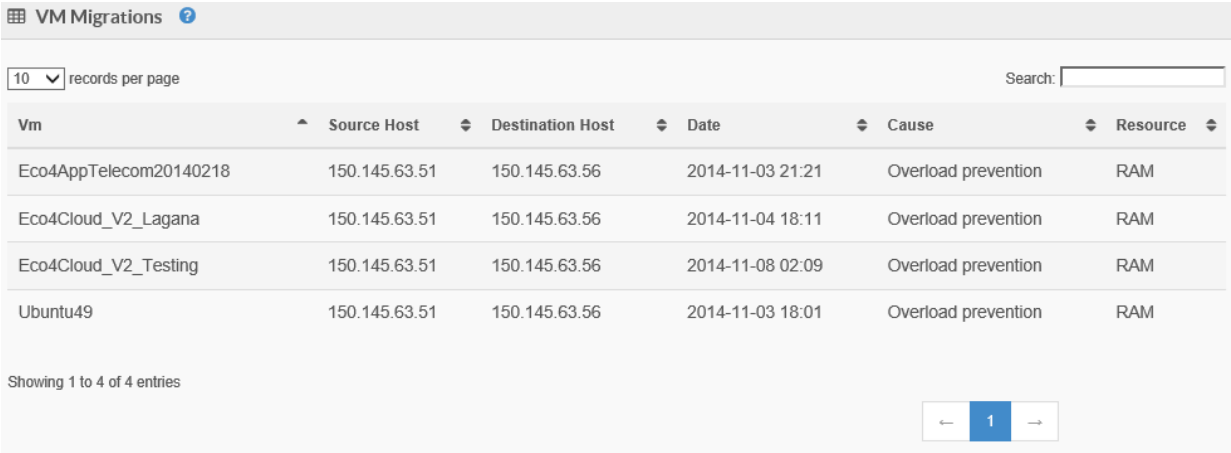


Fig. 60 VM Migrations issued.

Selecting a Host, you can see only **Host Switch On/Off Events** and **VM Migrations.**

Finally, selecting a VM you will see only **VM Migrations.**

Smart Ballooning

Smart Ballooning allows releasing unused memory by virtual machines and making it available for ESX/ESXi, which possibly will allocate it to other Virtual machine in the data center. Smart Ballooning is inspired by a mechanism already available in VMware systems, named memory ballooning, and which allows releasing consumed memory. In order to enable Smart Ballooning, switch it on in Smart Ballooning Settings pane.

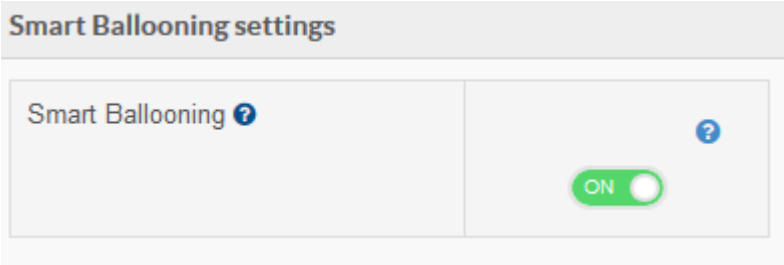


Fig. 61 Smart Ballooning settings

Under Smart ballooning setting pane, you will find the Smart Ballooning Operations table (Fig. 62) that shows the Smart Ballooning activities on each VM. In the table you will see when Smart Ballooning activities happened, as well.

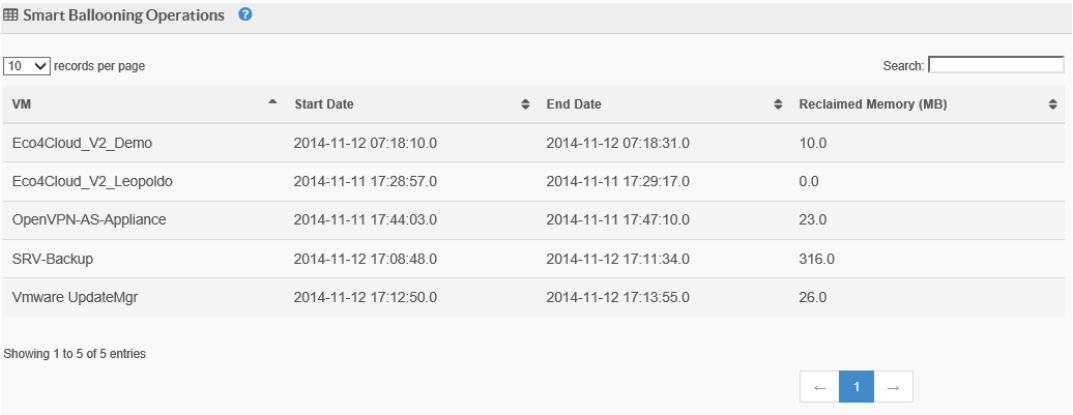


Fig. 62 Smart Ballooning Operations

The next two charts (Fig. 63 e Fig. 64) show the amount of memory reclaimed hourly by Smart Balloning and RAM Memory reclaimed by Vmware balloon driver respectively.

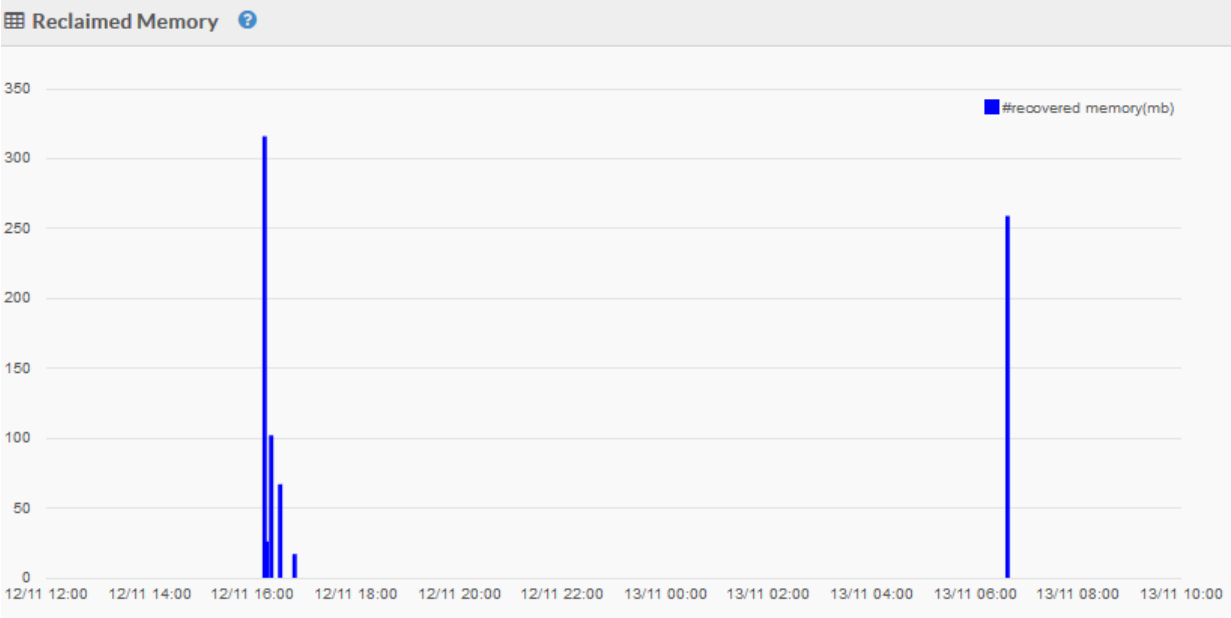


Fig. 63 Smart Ballooning Reclaimed Memory

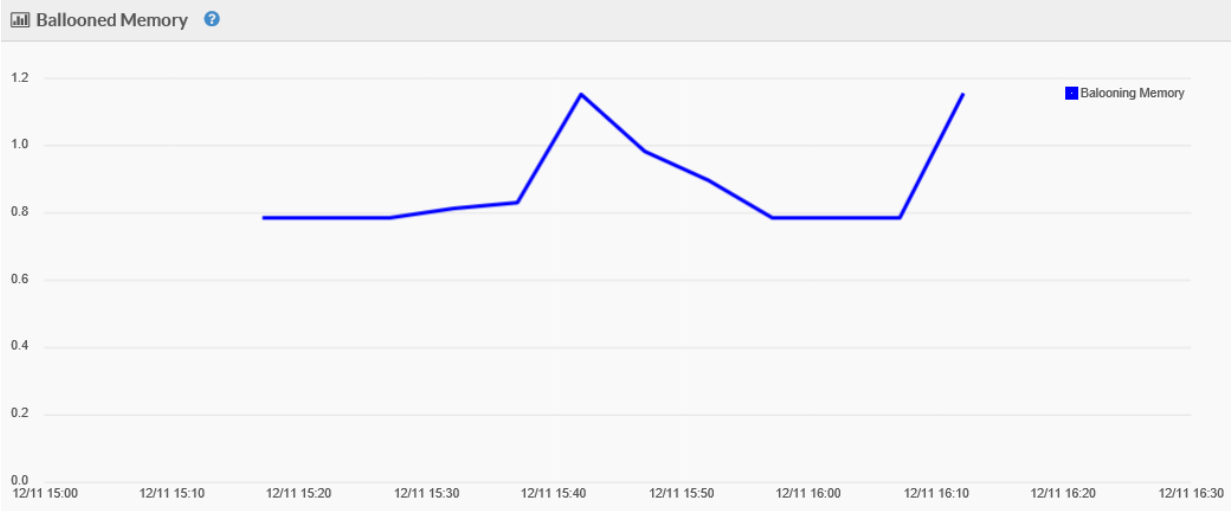


Fig. 64 Smart Ballooning Memory

Troubleshooter

Virtualization comes with a wealth of needed configurations, along with the benefits delivered by isolation of virtual machines. More often than expected, a virtualized environment is not properly configured, and non-optimal configurations lead to resources waste, poor consolidation ratio, uncertain SLA compliance.

Troubleshooter performs continuous monitoring of well-known virtualization options and sets immediate warning/alerts when wrong configurations are detected and Help virtual infrastructure administrator to solve possible drawbacks.

TOUBLESHOOTER SETTINGS

By clicking on troubleshooter button, the configuration settings pane appears (Fig. 65):

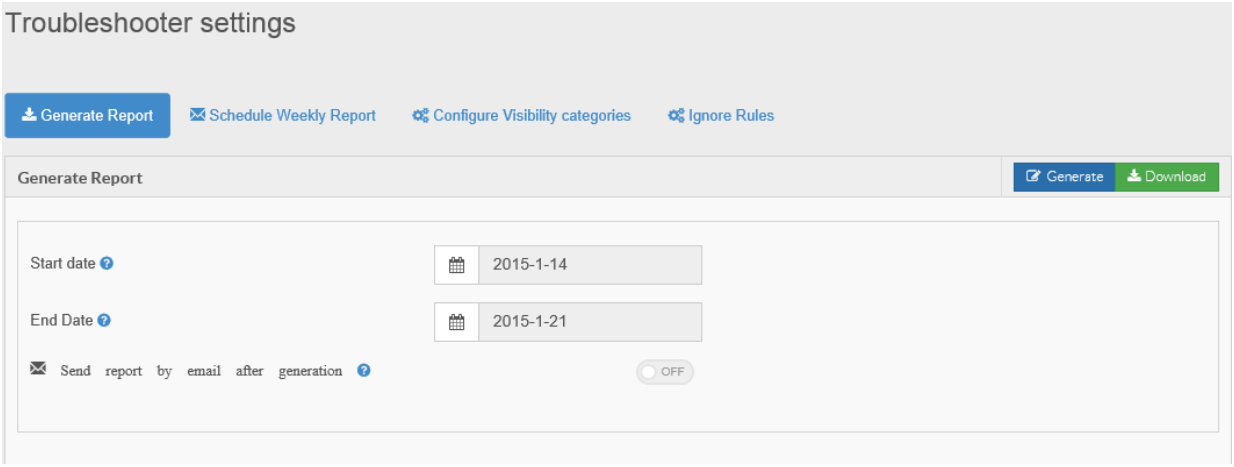


Fig. 65 Troubleshooter settings

You can immediately generate a report by selecting Start date and End date, moreover you can switch on **Send report by email after generation** to automatically send the Report to the **Mail Receivers** configured in Mailer configuration settings. You can also download the generated Report clicking on Download.

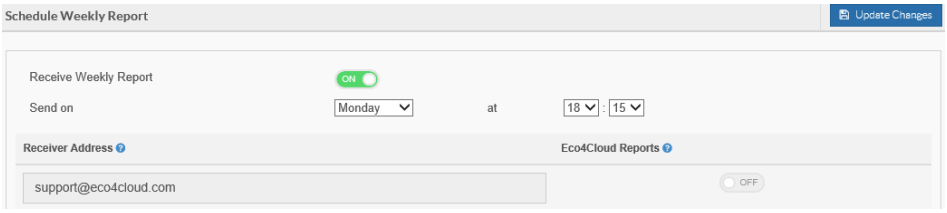


Fig. 66 Schedule Weekly Report

By selecting **Schedule Weekly Report** (Fig. 66) you can automatically receive weekly report. You need to specify the day and the hour and which users will receive the report by email.

By selecting **Configure Visibility categories** (Fig. 67), you can customize your reports.

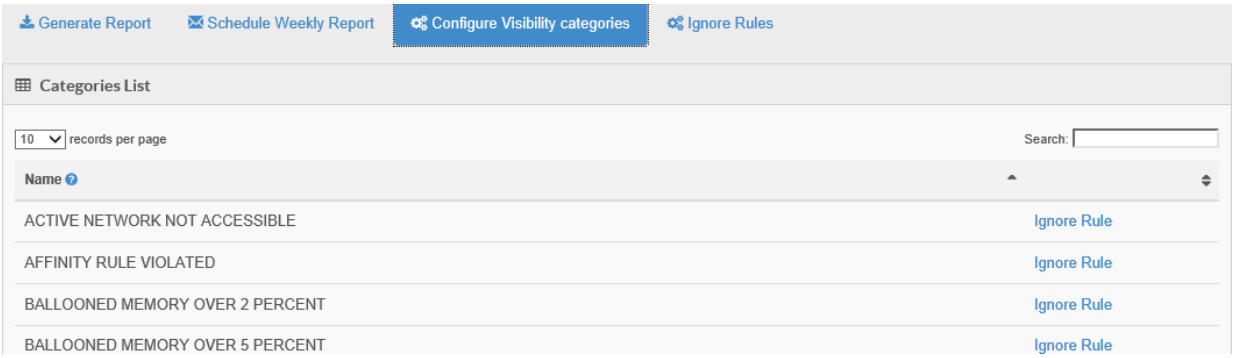


Fig. 67 Configure Visibility categories

Every category in the list is included in the report. If you want to exclude one of them from the report, click on **Ignore rule** on the right side, and a new pop-up appears (Fig. 68). Then you can decide if ignoring this category on all entities switching on the side button and/or **Ignore Category on Single Entity** such as Cluster, Farm Host or VM.

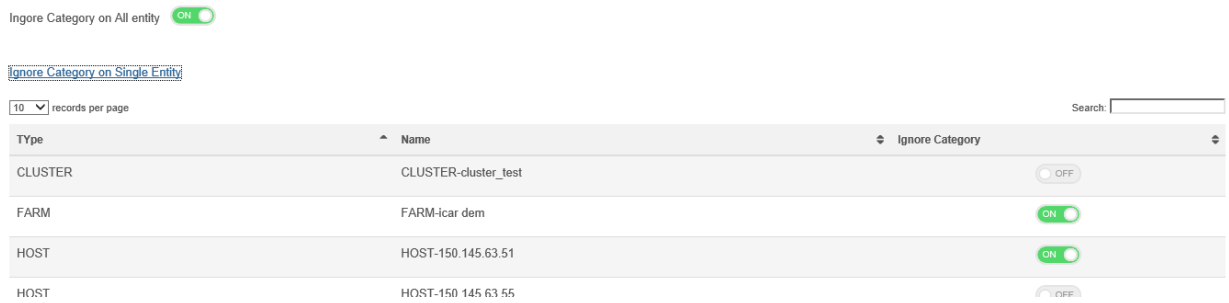


Fig. 68 Ignore Category list

In the last tab of Troubleshooter settings, there is a summary of all **Ignored rules** (Fig. 69). Every ignored rule can affect a single entity or a category or both. By clicking on **Resolve**, the rule is canceled.

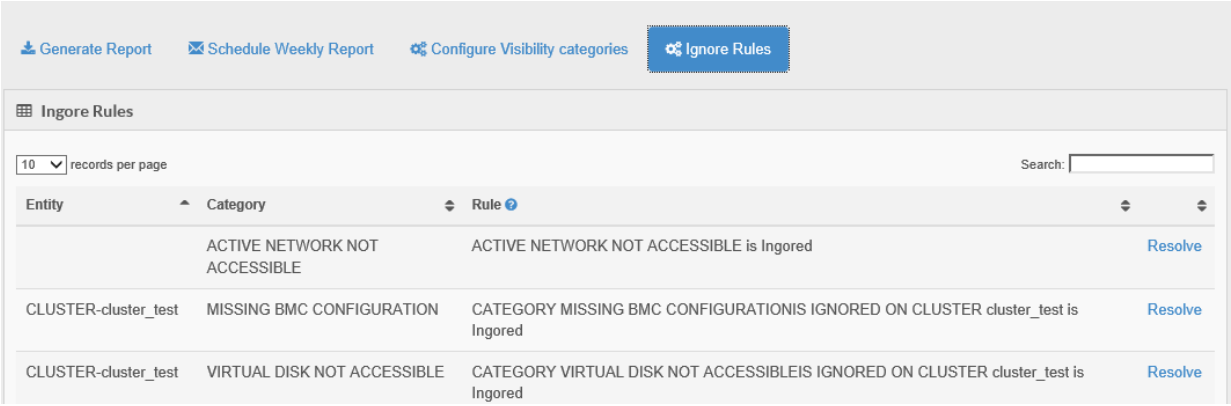


Fig. 69 Ignore Rules

TROUBLESHOOTER RISK AND EFFICIENCY

For every resource you select, troubleshooter will compute two scores: **Risk** and **Efficiency**. Risk is a value influenced by the set of problems, and respective severity, that affect the selected resource and all its children. The score is comprised between 0% (no observed problems) to 100% (maximum risk severity) value.

Fig. 70 Risk and Efficiency

Efficiency is a score conveying the right allocation (and configuration) of resources of selected resource and of all its children under it.

Fig. 70 shows risk and efficiency computed on a farm.

Fig. 71 represents Risk Factor deriving from hosts health state. In this charts, Troubleshooter represents the main risks for a farm such as high CPU ready time or too much Ballooned memory. Other risks are the Hosts in maintenance mode or hosts disconnected. Host operational status is represented also with the pie chart below.

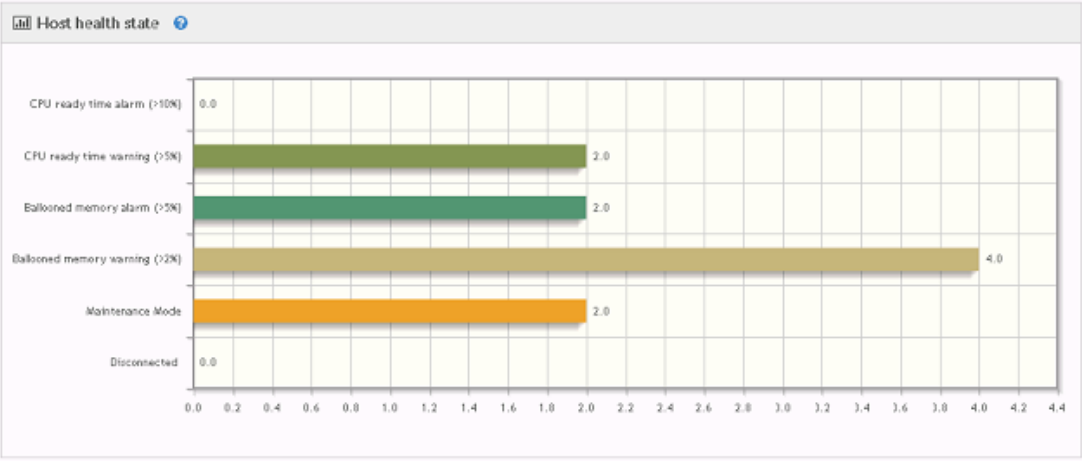


Fig. 71 Host health state

Fig. 72represents the factors affecting VMs performances such as Resources Limit, Resources reservation, etc. VMs resources reservation is represented also with the pie chart below.

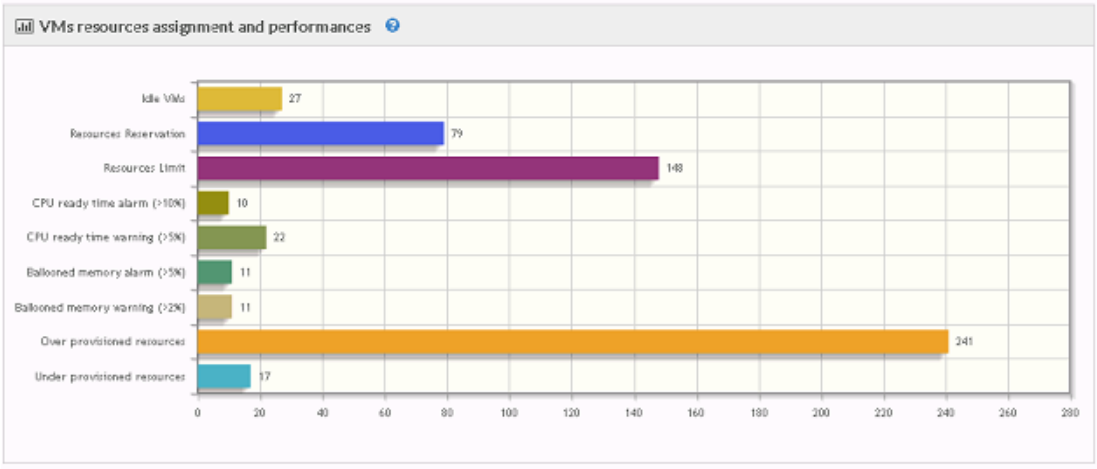


Fig. 72 VMs resources assignment and performances

Depending on the selected resource in the left pane, Eco4cloud Troubleshooter shows the specific **Entity Properties** (Fig. 73)

Entity Properties for:

- **Hosts**: show the possible states of hosts such as disconnected or Maintenance mode or ballooned memory alarm or Cpu ready time alarm.
- **VMs**: show the possible states of VMs such as powered off (idle) or ballooned memory alarm or Cpu ready time alarm or over/under provisioned, etc.

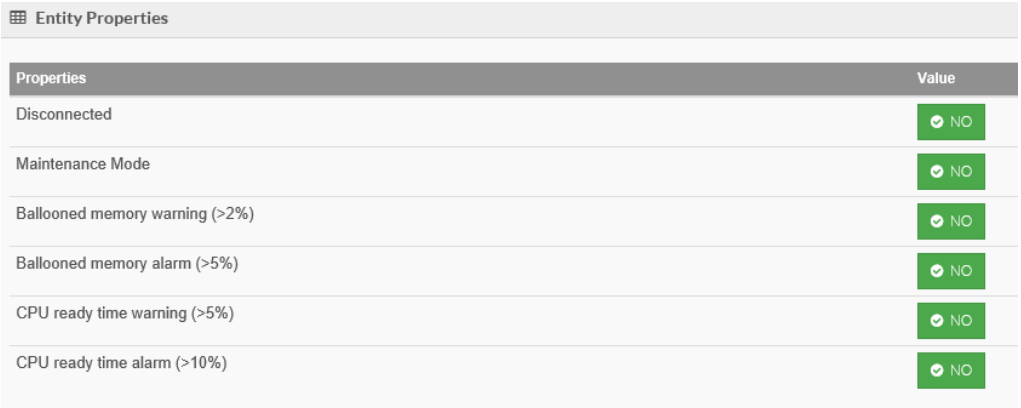


Fig. 73 Host entity properties

DETAILS VIEW

In order to understand errors and warnings, you can click on **Details** button near overview. Another pane (Fig. 74) opens and shows errors and warning by Categories and Problems and below you can find ignore rules that you have configured.

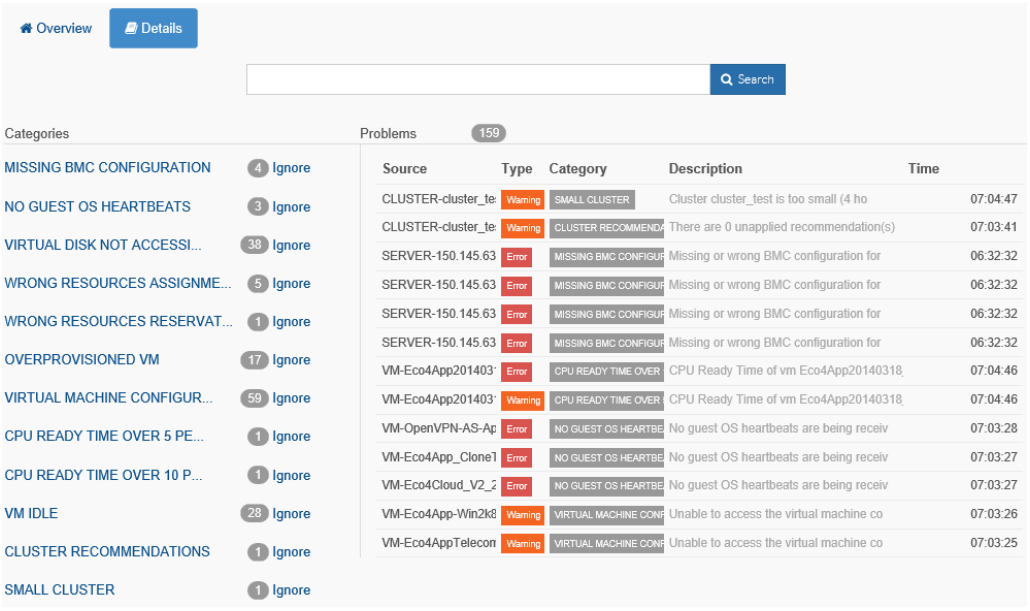

Overview
Details
Search
Categories
Problems
159
MISSING BMC CONFIGURATION 4 Ignore
NO GUEST OS HEARTBEATS 3 Ignore
VIRTUAL DISK NOT ACCESSI... 38 Ignore
WRONG RESOURCES ASSIGNME... 5 Ignore
WRONG RESOURCES RESERVAT... 1 Ignore
OVERPROVISIONED VM 17 Ignore
VIRTUAL MACHINE CONFIGUR... 59 Ignore
CPU READY TIME OVER 5 PE... 1 Ignore
CPU READY TIME OVER 10 P... 1 Ignore
VM IDLE 28 Ignore
CLUSTER RECOMMENDATIONS 1 Ignore
SMALL CLUSTER 1 Ignore
Source Type Category Description Time
CLUSTER-cluster_te Warning SMALL CLUSTER Cluster cluster_test is too small (4 ho 07:04:47
CLUSTER-cluster_te Warning CLUSTER RECOMMENDA There are 0 unapplied recommendation(s) 07:03:41
SERVER-150.145.63 Error MISSING BMC CONFIGUR Missing or wrong BMC configuration for 06:32:32
SERVER-150.145.63 Error MISSING BMC CONFIGUR Missing or wrong BMC configuration for 06:32:32
SERVER-150.145.63 Error MISSING BMC CONFIGUR Missing or wrong BMC configuration for 06:32:32
SERVER-150.145.63 Error MISSING BMC CONFIGUR Missing or wrong BMC configuration for 06:32:32
VM-Eco4App201403 Error CPU READY TIME OVER CPU Ready Time of vm Eco4App20140318 07:04:46
VM-Eco4App201403 Warning CPU READY TIME OVER CPU Ready Time of vm Eco4App20140318 07:04:46
VM-OpenVPN-AS-Ap Error NO GUEST OS HEARTBE No guest OS heartbeats are being receiv 07:03:28
VM-Eco4App_Clone1 Error NO GUEST OS HEARTBE No guest OS heartbeats are being receiv 07:03:27
VM-Eco4Cloud_V2_2 Error NO GUEST OS HEARTBE No guest OS heartbeats are being receiv 07:03:27
VM-Eco4App-Win2k8 Warning VIRTUAL MACHINE CONF Unable to access the virtual machine co 07:03:26
VM-Eco4AppTelecon Warning VIRTUAL MACHINE CONF Unable to access the virtual machine co 07:03:25

Fig. 74 Details view

By clicking on the name of a category a new browser window links the Eco4cloud Knowledge Base explaining the problem and the official solution by the relative vendor and/or Eco4Cloud. Beside the category, there is the occurrences number and then the **ignore** link.

Fig. 75 Ignore

You can choose if to ignore the error on the selected entity, or on all entities, or even to ignore all problems on the entire Farm, by switching right side button on/off, finally pressing **Save Changes** button.

On the right side of Details pane there is the list of all problems. By clicking on a single problem you can see the details, such as where the problem is, at which time it occurred, and the description.

Finally, on the bottom of details pane, you can find the exclusion rules**.** Clicking on **active** link you can see **Ignore Reason List** (Fig. 76) that shows where the rule is applied. On the right side, you can click on **resolve** to cancel the rule.

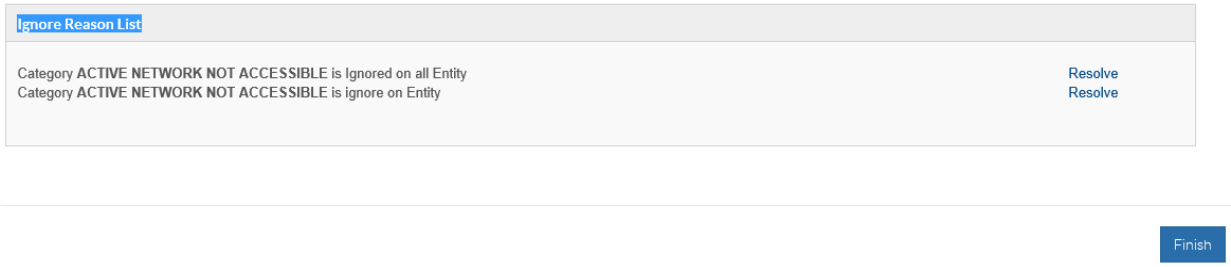

Ignore Reason List
Category ACTIVE NETWORK NOT ACCESSIBLE is Ignored on all Entity
Category ACTIVE NETWORK NOT ACCESSIBLE is ignore on Entity
Resolve
Resolve
Finish

Fig. 76 Ignore Reason List

CDSM - Capacity Decision Support Manager

Capacity Decision Support Manager (CDSM) is a capacity planning software, enhanced by Eco4Cloud's workload consolidation algorithm, which provides a solution to efficiently plan and use shared pools of resources in virtualized data centers.

Eco4Cloud's CDSM addresses and solves the capacity planning problem by modeling it with historical workloads and considering the peak workload for resource allocation. In fact, CDSM creates demand patterns through the analysis of workload traces measured in the data center. This enables CDSM to accurately predict future demands.

CDSM allows planning the whole virtualization layer within few minutes from the initial deployment. The setup is quick and hassle-free. CDSM immediately starts collecting historical performance data sampled by virtualization platform and makes capacity planning features available in few minutes.

The results obtained through CDSM are enhanced by Eco4Cloud's workload consolidation algorithm, guaranteeing the best resource utilization possible.

CDSM WIZARD

Clicking CDSM button, the CDSM list pane appears. This shows all CDSM scenarios you made and a **new CDSM** button to create a new one. In the general settings you can choose the scenario name and the type of environment: **Production** to priorize QoS or **Test and Dev** to priorize resources efficiency.

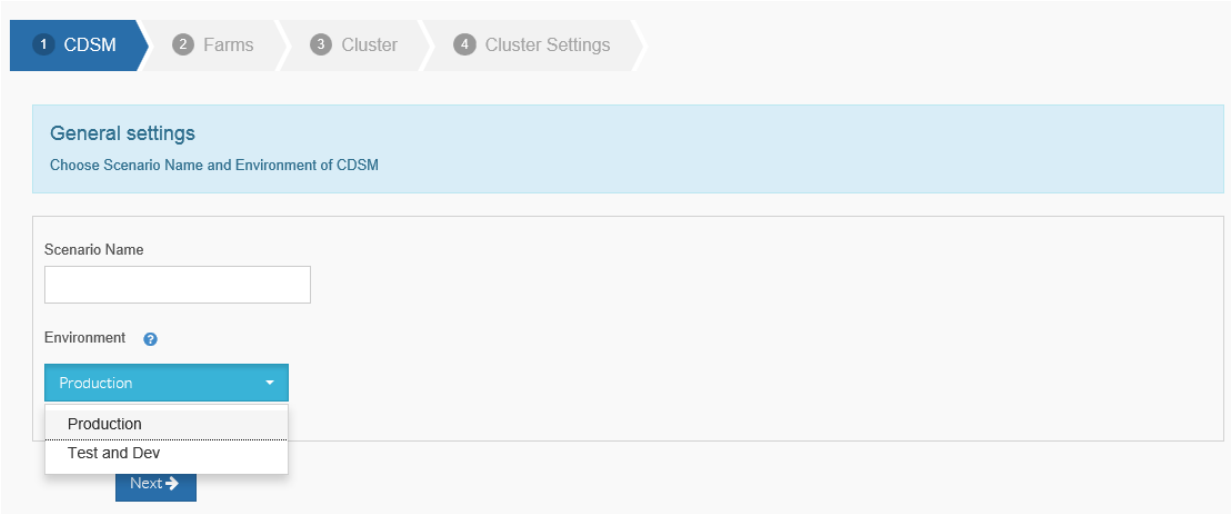


Fig. 77 New CDSM wizard

In the next page, you can choose the farm included in the scenario, if you have more than one.

The next step is choosing the clusters to include (Fig. 78). You can also exclude one of the listed clusters by switching off the button.

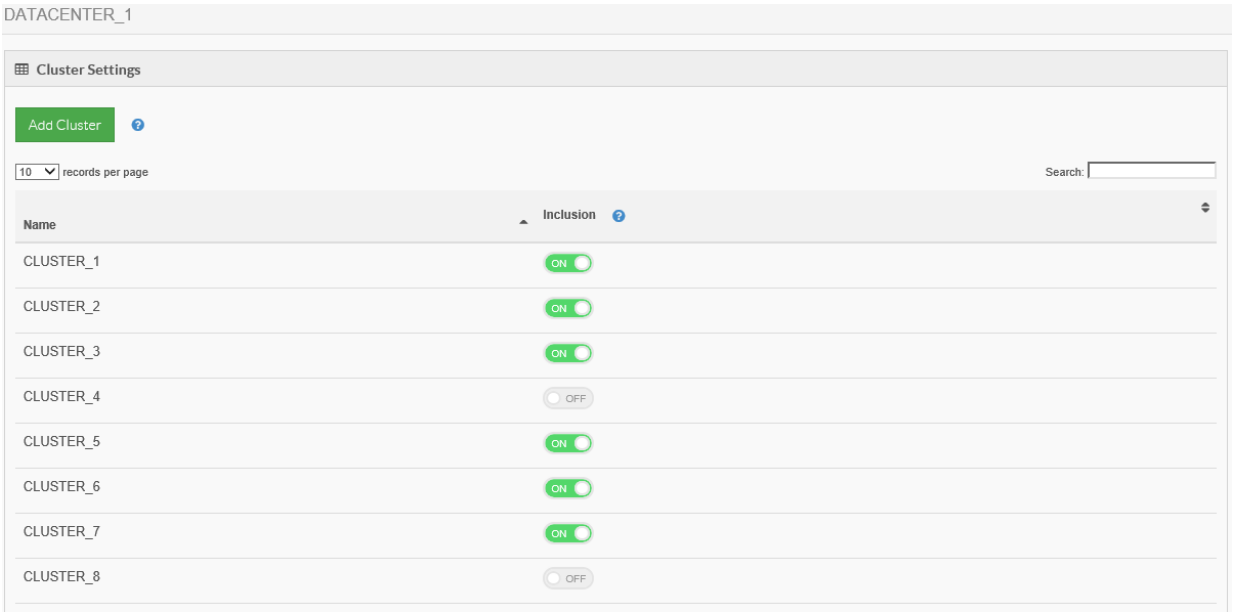


Fig. 78 Cluster settings

You can create a new cluster, too, by clicking on **Add Cluster** button and adding a name (Fig. 79). Afterwards, in the final step, you will choose the load for this cluster.

Fig. 79 Add Cluster

After clicking on **Add** and then clicking on **Next**, the final step is changing workload and hosts settings for each cluster (Fig. 80).

Fig. 80 Cluster Settings

First and foremost, you can choose the global settings (Fig. 81) for all clusters such as **Load** or **Hosts Action**

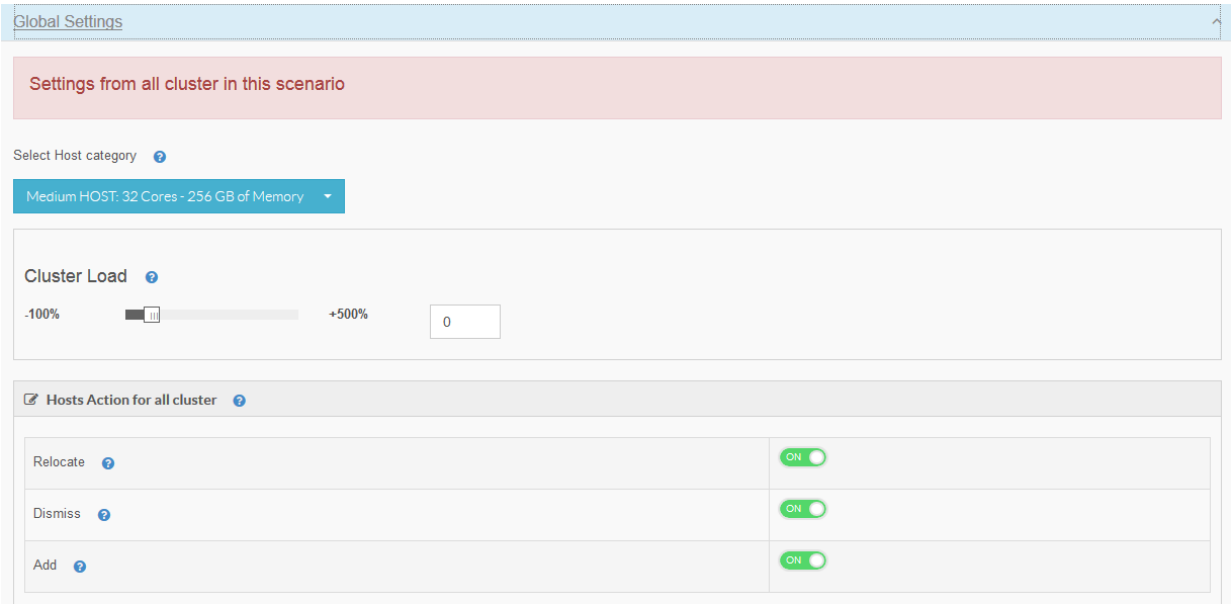


Fig. 81 Global Settings

You can choose also the **host category.** The menu proposes three types of host as shown in the below figure (Fig. 82). These represent three typical host configurations combining different amount of CPU and memory. The hosts, according to your choice, will be added to your environment if needed.

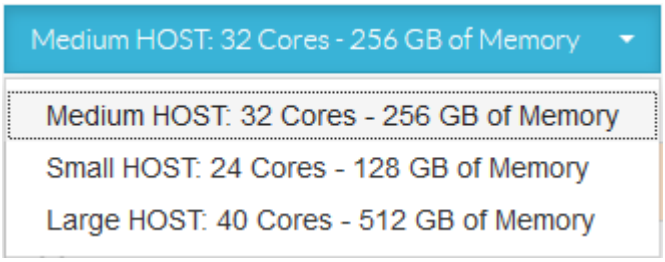

Medium HOST: 32 Cores - 256 GB of Memory
Medium HOST: 32 Cores - 256 GB of Memory
Small HOST: 24 Cores - 128 GB of Memory
Large HOST: 40 Cores - 512 GB of Memory

Fig. 82 Host category

NEW CLUSTERS CONFIGURATION

For new clusters you can configure incoming load in term of VMs. By clicking **Add VM Template** button, you can choose the number of VMs, the **type,** and the percentage of **CPU usage** and **RAM usage** (Fig. 83). When you click on type menu, a list of VMs templates that will be used to simulate the load appears, from a **tiny VM** template with one CPU core and 512 MB of RAM until **Gigantig VM Plus** template with 24 CPU cores and 64 GB of RAM. Furthermore, in the **Cluster Property** pane, by switching on/off **Relocate,** you can decide if this cluster can be modified during the scenario creation moving in hosts from other clusters or moving hosts out to other clusters.

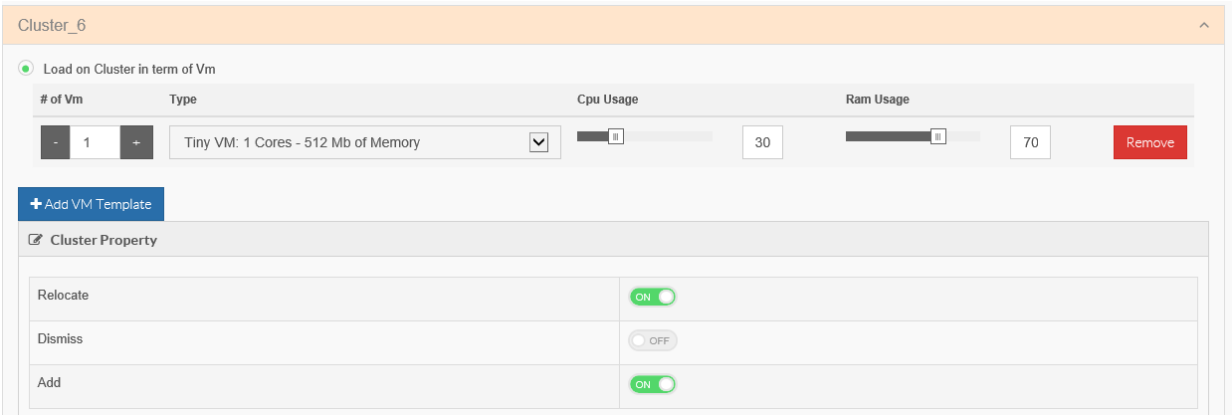


Fig. 83 Adding load to new cluster

Finally, if you would to add new hosts to this cluster, switch on **Add**.

EXISTING CLUSTERS CONFIGURATION

The first step of an existing cluster configuration, is to decide if the type of load on the cluster will be calculated on percentage of Load variation or in term of VMs.

Load variation

Default choise is **Load variation** and it can be modified increasing or decreasing **Cluster Load** slider.

When the percentage gets modified, the **number of VMs** in the **Current Cluster Load** pane varies. The **Type** of VM displayed represents a sample of all VMs inside the cluster. In the case that the cluster load type is based on Load variation, the type of VM, **CPU usage** (Typical daily based maximum CPU usage of the VM) and **RAM usage** (Typical daily based maximum memory usage of the VM) cannot be modified.

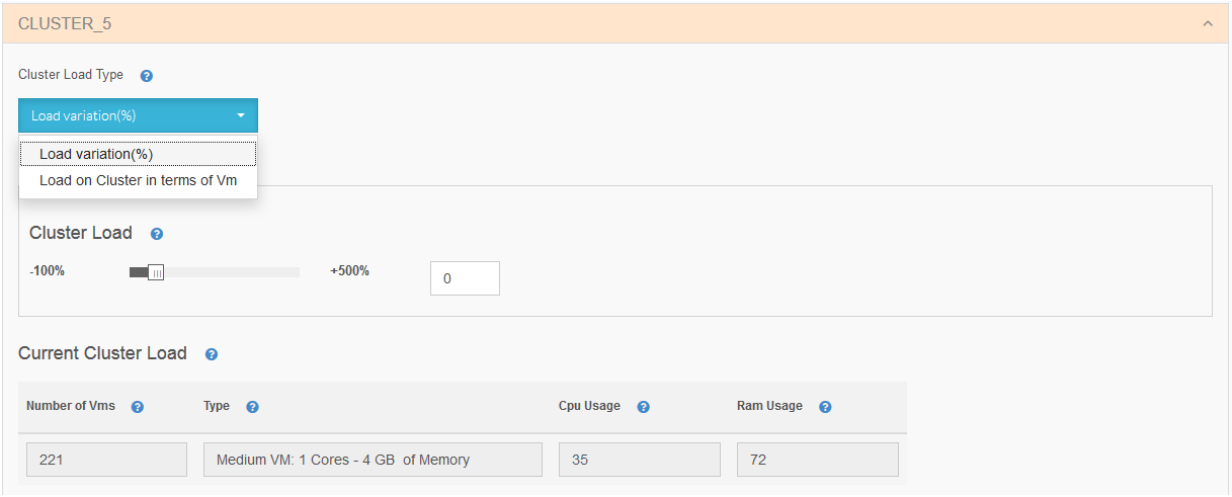


Fig. 84 Load Variation (%).

Load on Cluster in terms of Vm

Choosing **Load on Cluster in terms of VM**, you could change all the values in **Cluster Load** pane (Fig. 85).

The **number of VMs** currently shown, represents the original number of VMs; it can be changed with the best value that fits your aim. The type of VM displayed is a representative sample of all VMs inside the cluster and cannot be modified. Instead, **CPU usage** and **RAM usage** can be modified either by the slider or manually writing the value in the field.

If you want **Additional workload**, you can add other VMs, by pressing **Add VM Template** button. In this pane, you can modify **number of VMs, Type** of VM, **CPU usage** and **RAM usage.**

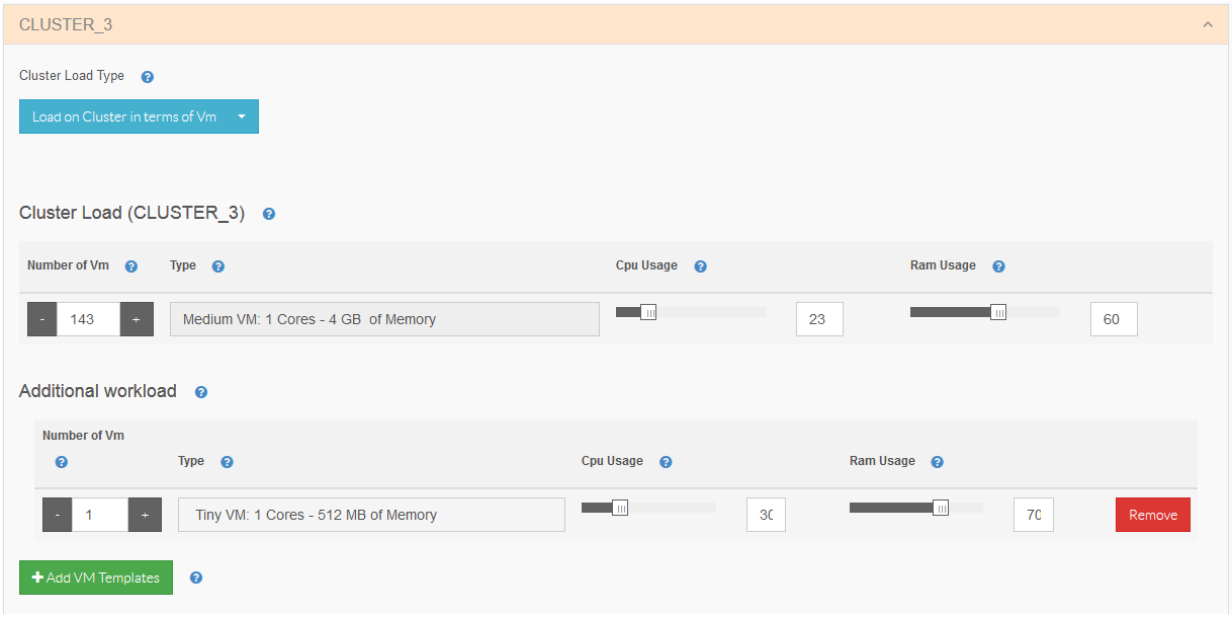


Fig. 85 Load in term of VMs.

When you click on **Type** menu, a list of VMs templates that will be used to simulate the load appears, wich allows selecting the VM category ranging from a **tiny VM** template with one CPU core and 512 MB of RAM up to **Gigantic VM Plus** template with 24 CPU cores and 64 GB of RAM.

Host Action

In the **Host Action** pane you can specify which actions to enable on the hosts of the current cluster. The **Relocate** and **Add** options have already been covered. **Dismiss** option allows to remove obsolete and inefficient hosts from this cluster.

CDSM REPORT

After configuring all settings and pressing the **Run** button, CDSM will generate a report. A brief introduction will describe what CDSM is and what the output of the scenario will be.

The first paragraphs of the report will describe the scenario of the test and the **Resources utilization**, with a major focus on Ram usage during monitoring period. In **Scenario Parameter** paragraph**,** you will find the summary of configuration settings of all clusters that you made.

The following paragraph will show the results that consist in two scenarios for all single clusters, both of them contains:

- Residual workload on each cluster
- How many hosts, if any, are needed to add to each cluster
- Which hosts are recommended to relocate for optimal hardware usage
- Which hosts are recommended to dismiss due to inefficiency

The first scenario, called *"Low Impact"* is a light solution, where workload is distributed on available hosts and only useless hardware is dismissed.

The second scenario, called *"High Impact" is a solution in which all obsolete hardware is replaced by newer and more efficient hardware.*

At last, the **Final Considerations** paragraph will display the list of actions you need to take on the hosts in order to achieve the given goals, for each scenario, and eventually the shopping list!

Appendixes

APPENDIX A – PRIVILEGES

The following tables list the privileges that should be assigned to the Eco4Cloud user. When setting permissions, verify all the object types are set with appropriate privileges for each particular action. Some operations require access permission at the root folder or parent folder in addition to access to the object being manipulated. The best practice is to add privileges to the root folder in order to ensure the user has all the needed privileges all over the virtualized environment.

Requirements

Initially, a Windows user must be registered on the server where vCenter is installed with the name of **eco4cloud**. The user can be created locally if working on a stand-alone server or in the domain if working on an active directory environment.

Manual Role creation

In the section Home -> Administration -> Roles (Fig. A) a new role must be created with the set of privileges in the following. The name to assign to role will be **E4CRole**

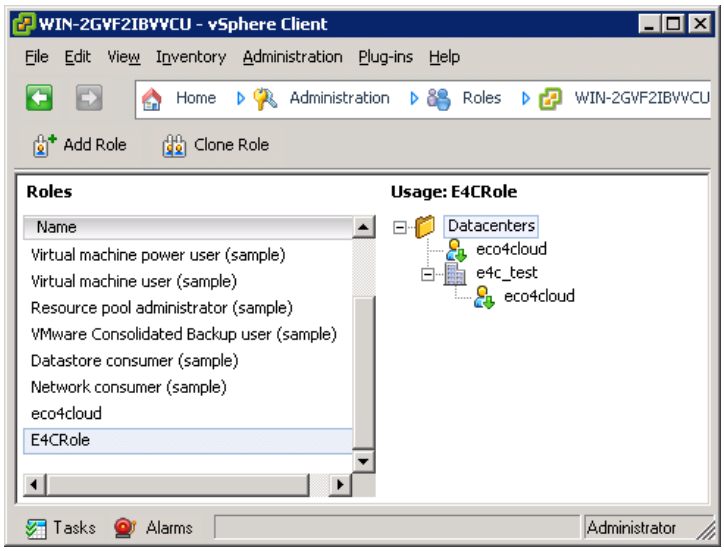


Fig. A Role creation

APPENDIXES

Automatic Role Creation by powershell script

We create two PowerCli scripts for automatic role creation:

1. CreateEco4CloudRole.ps1
2. CreateEco4CloudRole_PowerCLI4.0.ps1

The first one is for powerCli version 5.0 or above, the second one for Powercli version 4.0

The scripts can be used on the vCenter server locally or remotely from other PC with Powercli installed on.

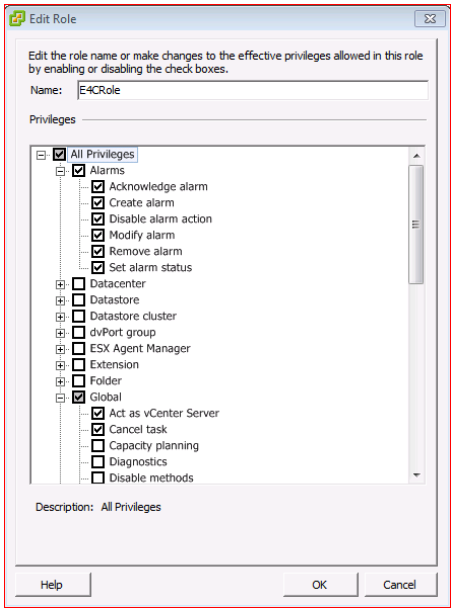
In local mode you have to open a PowerCli console with administrator permission and launch **CreateEco4CloudRole.ps1**. The script will create E4CRole with the necessary permissions.

In remote mode you have to open a PowerCli console and launch the same script with following parameters: vCenter Ip Address, vCenter administrator username and password

CreateEco4CloudRole.ps1 vCenterAddress vCenterUsername vCenterPassword

After creating E4CRole, you can add **eco4cloud** user account to the role.

Now it is possible to assign the needed privileges by clicking with the right button of the mouse on the name of the role.



Alarms privileges: control the ability to set and respond to alarms on inventory objects.

This class of privileges is useful to insert automatic alarms within the vCenter in case of overloads.

Acknowledge alarm: recognition of an alarm

Create alarm: creation of a new alarm.

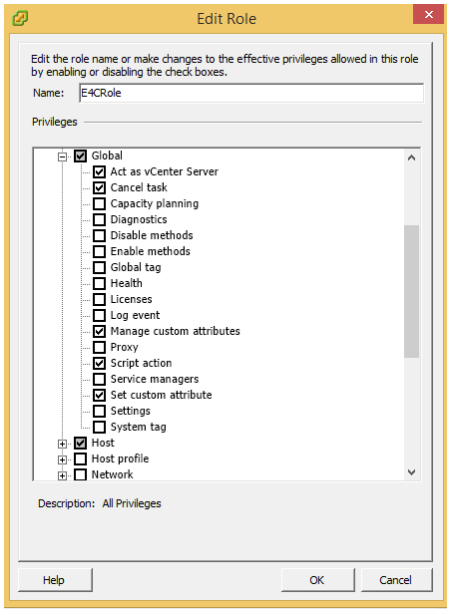
Disable alarm action: block of the reaction to an alarm

Modify alarm: modify of an alert object

Remove alarm: removal of an alert object

Set alarm status: modify the status of an alarm to Normal, Warning, or Alert

Fig. B Alarms



Global privileges: control global tasks related to tasks, scripts, and extensions. Furthermore it is used to manage custom attributes such as Annotations.

Act as vCenter Server: Prepares or starts a vMotion

Cancel task: Cancels an executing task

Manage Custom attributes: Add, remove, or rename custom field definitions.

Script Action: Schedule a scripted action in conjunction with an alarm.

Set Custom attribute: View, create, or remove custom attributes for a managed object.

Fig. C Global

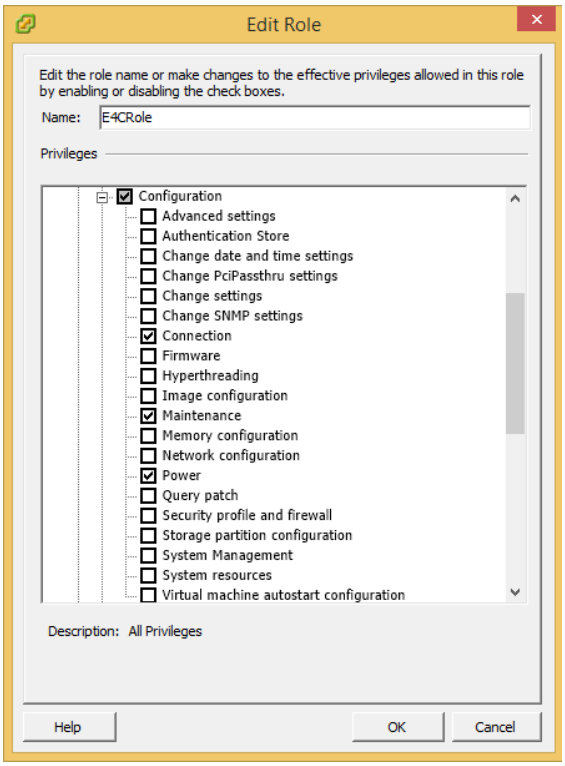


Fig. D Host: configuration

Privileges **Host->configuration**: in this section privileges for hosts configuration are set.

This class of privileges is useful to put hosts in maintenance mode or power them down.

Connection: Change the connection status of a host (connected or disconnected).

Maintenance: allows to put a host in maintenance mode for administrator tasks, such as update and reconfiguration, and allows to power down and reboot a host.

Power: configuration of energy savings settings.

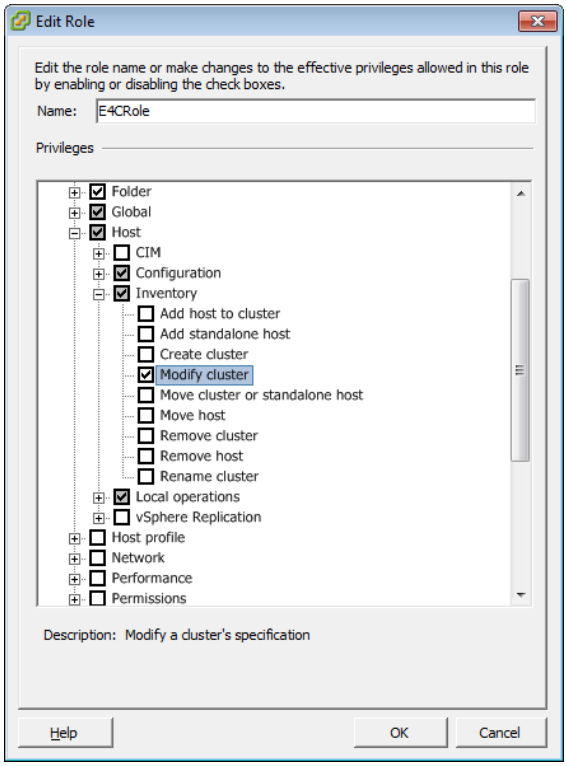


Fig. E Host: Inventory

Privileges **Host->inventory**: in this section privileges for hosts inventory are set:

Host inventory privileges control adding hosts to the inventory, adding hosts to clusters, and moving hosts in the inventory. So it is required to put a cluster in partially/fully automated or manual mode

Modify cluster: Change the properties of a cluster.

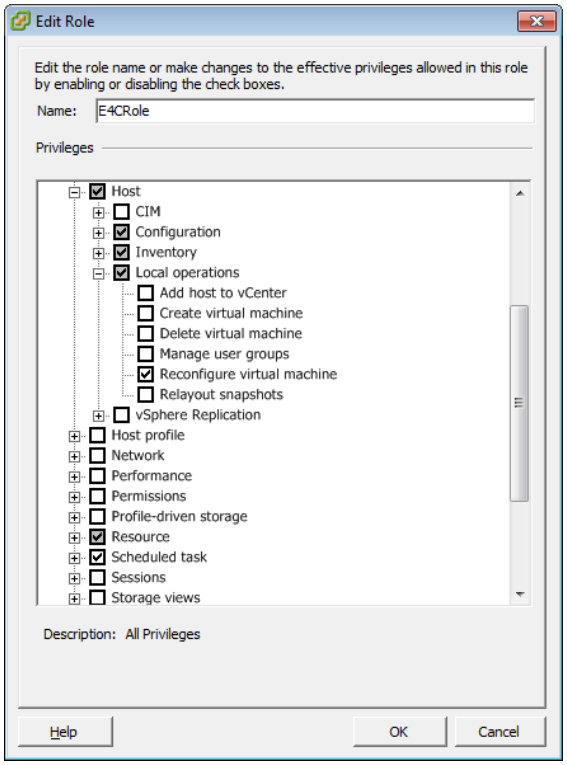


Fig. F Host: Local Operations

Privileges **Host->Local Operations**: controls action executed when vSphere Client is directly connected to a host.

This class of privileges is needed by the "smart ballooning" module, because the module should modify VM memory resources limits.

Reconfigure virtual machine: reconfgure virtual machine memory limits

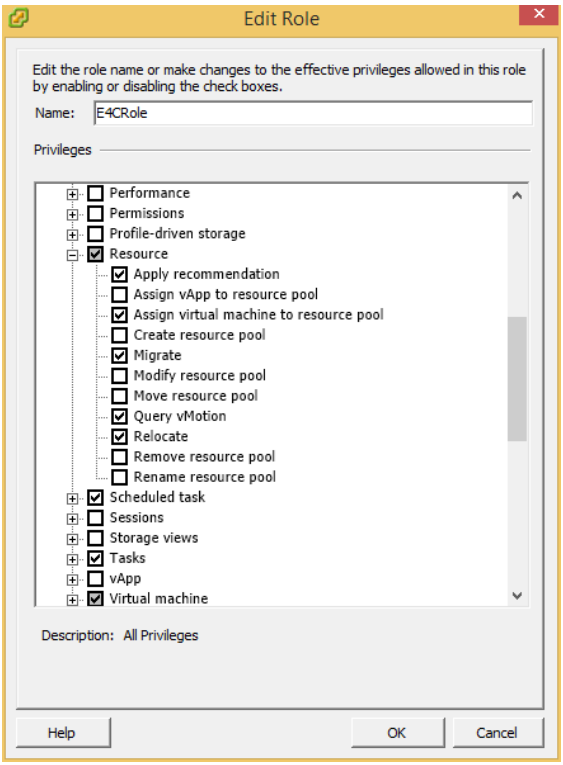


Fig. G Resource

Privileges **Resource**: controls resources pool and virtual machines migrations.

Apply reccomendation: Ask the server to go ahead with a suggested vMotion.

Assign virtual machine to resource pool: Assign a VM to a specific resource pool

Create resource pool: resource pool creation

Migrate: VM migration to a resource poll or a host

Modify resource pool: modificare pool di risorse

Move resource pool: spostare un pool di risorse

Query vMotion: verify compatibility of a VM to a target host for vMotion

Remove resource pool: cancel a resource pool

Rename resource pool: rename a resource pool

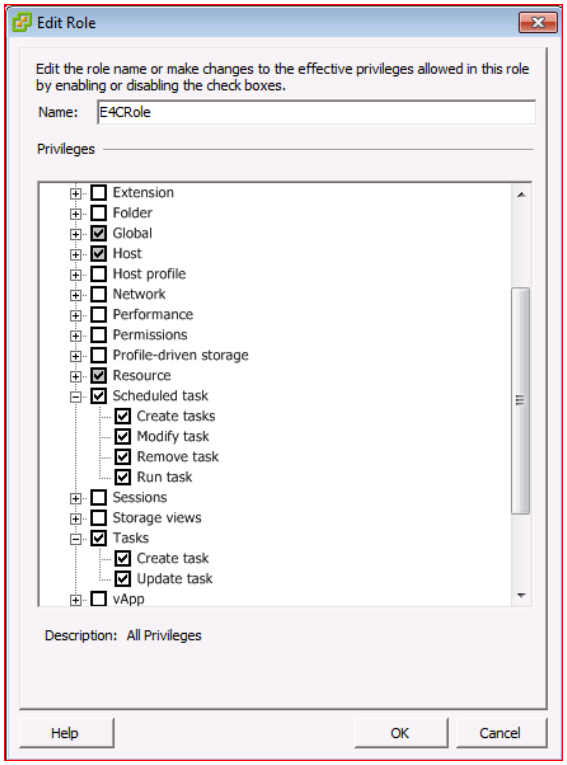


Fig. H Tasks and Scheduled task

Privileges **Scheduled Task**: control the ability to create, modify and removed scheduled tasks.

Create tasks: create a new scheduled task

Modify task: modify a scheduled task

Remove task: remove a scheduled task

Run task: run a scheduled task

Privileges **Tasks**: control extensions ability to create and update activities on vCenter server.

Create task: allows an extension to create a user defined task.

Update task: allows an extension to modify a user defined task.

This class of privileges are useful to schedule needed operations to VM consolidation.

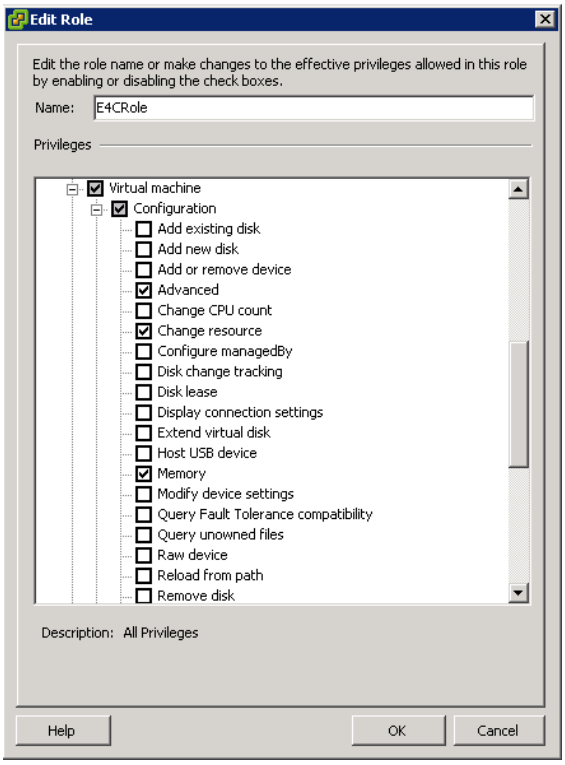


Fig. I Virtual Machine: configuration

Privileges **Virtual Machine -> configuration**: control the ability to configure VM and devices options.

Advanced: add or modify advanced options in VM configuration file.

Change resource: Change resource configuration of a set of VM nodes in a given resource pool. It is required for the use of the Smart Ballooning .

Memory: modify the allocated memory to the VM.

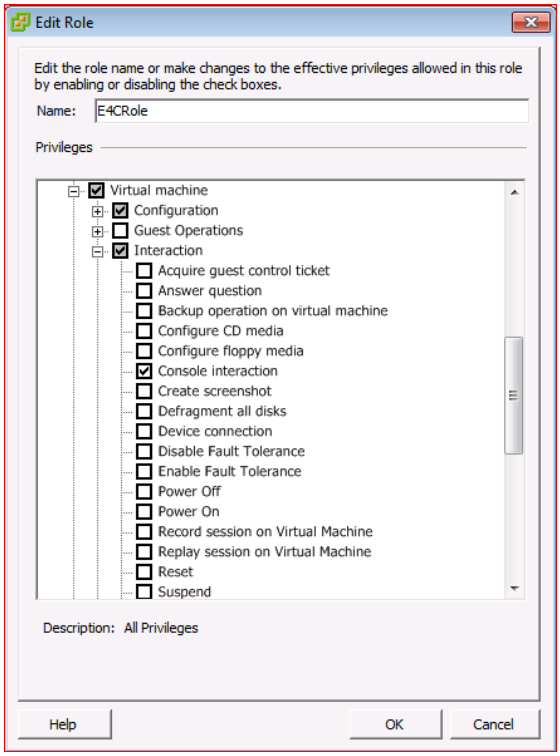


Fig. L Virtual Machine: Interaction

Privileges **Virtual Machine -> Interaction**: control the ability to interact with VM console, configure media, execute power up/down operations and install VMware Tools.

Console Interaction: interaction with VM, using mouse, keyboard and monitor.

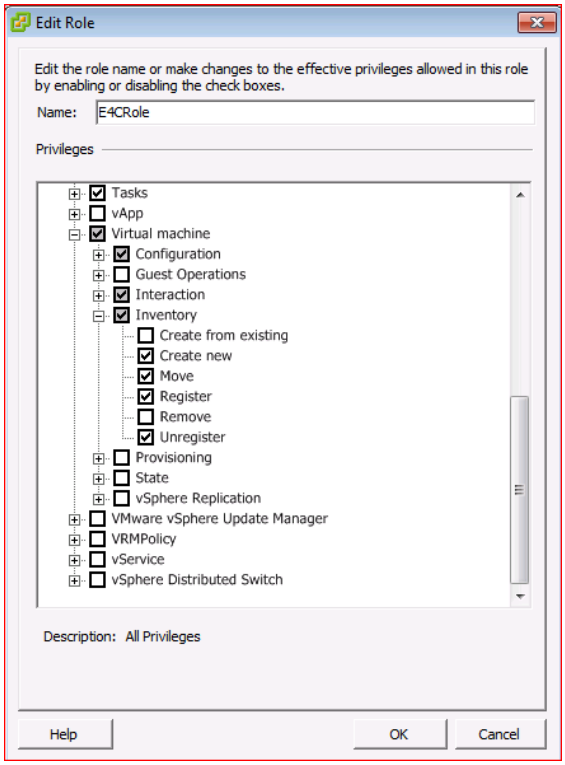


Fig. M Virtual Machine Inventory

Privileges **Virtual Machine -> Inventory**: control the ability to add, move and remove VMs.

This class of privileges is needed to issue vMotions.

Create new: Create a new VM

Move: move a VM in the hierarchy

Register: add a VM to vCenter server or host inventory

Unregister: remove a VM to vCenter server or host inventory

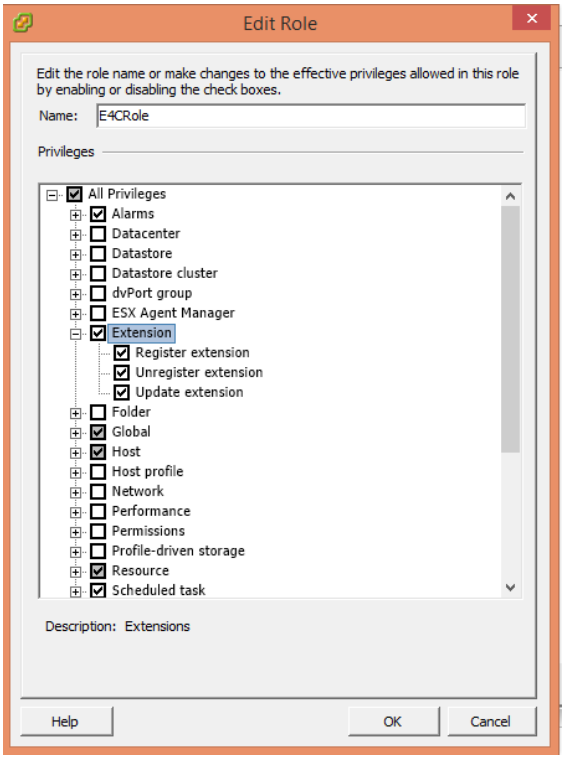


Fig. N Extension

Privileges **Extension**: control the ability to install and manage plug-ins

This class of privileges is needed to use Eco4Cloud Plug-in

Register extension: Registers an extension (plug-in)

Unregister extension: Unregisters an extension (plug-in)

Update extension: Updates an extension (plug-in)

APPENDIXES

APPENDIX B – IMPORTANT NOTES ABOUT ECO4CLOUD SOFTWARE

During normal operations, eco4cloud software will generate two scheduled tasks

1. "HypervisorLifeChecker"
2. "E4C Crash Detection Task"

and an alarm:

1. "E4C Crash Detection Alarm"

These tasks and alarms are needed to allow normal vCenter operation in case of failure of eco4cloud or in case vApp doesn't reach vCenter. **These tasks and alarms must not be canceled.**